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September 1961

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Tuna Fleet Scatters; Fish Prices Increase; Albacore Moves North

● Following a good run of Skipjack in Ecuadorian and Peruvian waters, and a flurry of local California Bluefin, the tuna fleets were scattered all the way from San Clemente Island to Panama as the month of August drew to a close.

Fishing had become spotty. For a few days, weather chased the vessels into port. Yet in spite of uncertain luck, the total year-to-date catch of tuna still stood at a five-year record high—104,072 tons—at mid-August, as reported by the US Bureau of Commercial Fisheries.

The Bluefin run, while not measuring up to the 1959 Bonanza, was good solid fishing. The Bureau reported domestic landings of 604 tons, 734 tons, 1041 tons and 983 tons for the four weeks between mid-July and mid-August. At the middle of August, the year-to-date catch of Bluefin was still ahead of 1960's with 3972 tons to 3675 tons, but behind 1959, which rose to 4990 tons.

● During the third week of July the tuna purse seiners went out and caught 1216 tons of Skipjack in Southern waters, the best haul of the striped beauties in many months; and to judge by watching some of the boats unload on the San Pedro waterfront, the fish were good sized. But the run didn't last long. Figures for the year to mid-August show the total Skipjack crop for the year so far is still behind last year's, 15,569 tons to 17,225. Meanwhile, the year-to-date catch of Yellowfin is 'way up to 77,459 tons including transshipments.

The increasing catch of Yellowfin by the big tuna purse seiners has brought up the question of possible control. The Inter-American Tropical Tuna Commission's US delegation met last month with its tuna scientists headed by Dr. Milner B. Schaefer and was understood to have recommended holding a full Commission meeting in September to study the matter of recommending international control of Yellowfin fishing.

The price of Yellowfin went up generally $10 per ton to $260, without a corresponding increase in Skipjack prices, so the spread between the fishermen's price for the two species is greater now than usual, and the incentive to catch Skipjack is weaker relatively than stronger.

Fishing being spotty, there were no spectacularly short trips reported by the seiner skippers, but local Bluefin trips were short and profitable.

Albacore Moves in Price

● Albacore went up, in more ways than one. In price, it rose generally $25 per ton to $375, highest it has been this season and a substantial $50 a ton higher than the closing price last year.

On the map, the Albacore started to move north, as is their custom, except that this year they moved earlier in the season. The Albacore fleet at mid-August was scattered all the way north along the coast to Southern Oregon and reported to be doing fairly well; but nothing to wire home about. Some of the larger Albacore boats were fishing farther offshore in more southerly latitudes.

Oceanographers point out that seawater temperatures this year have been temperamental, varying more than usual, possibly due to more upwelling of cold water from the bottom of the sea to the surface. The upwelling, in turn, is guessed to be the result of winds blowing from a single direction for a prolonged time. In any case, even amateur swimmers off the beaches will tell you that between the first and last weeks of July it felt like a different ocean. The Albacore, which like their own familiar type of ocean, presumably have reacted to spotty sea weather by yielding spotty catches.

Some of the Southern California tuna purse seiners looking for Bluefin found considerable Albacore running with the Bluefin, and catches up to ten tons or so of Albacore were brought in by some of the big boats.

Imports of Frozen Tuna Down

● Imports of frozen tuna of all species were drastically down, the total of California imports having dropped about a third from the 1960 year-to-date figure. So great was the loss in imports that although the domestic catches were up for the year, the total tonnage of fish received by California canneries was lower this year to date than last.

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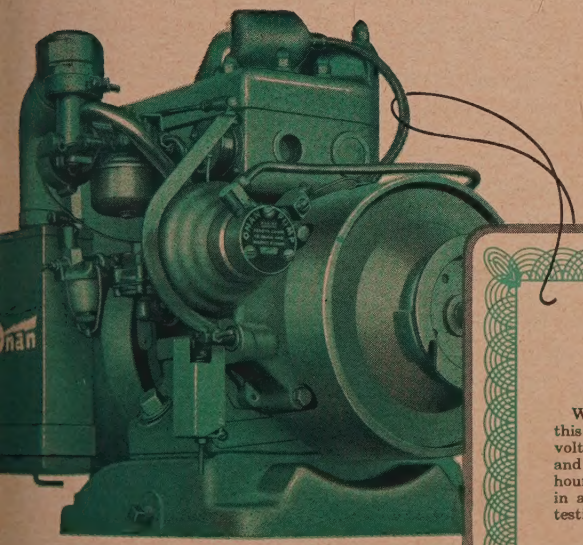

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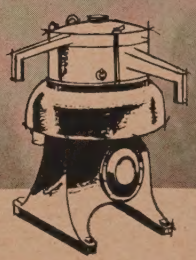

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Co-owners William Selset, Captain, and Reidar Selset, Chief Engineer, on the bridge of the Pacific halibuter *New Era*. The boat's new Waukesha Engine drives through a Twin Disc MG-512 Reverse and Reduction Gear

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- Seven reduction ratios—from 2:1 to 6:1—in two different boxes for correct matching to any wheel
- Fingertip hydraulic control for smooth, instantaneous response
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- Emergency "come home" feature in case of hydraulic system failure
- "In the boat" serviceability — both clutches removable with gear attached to engine

Twin Disc Marine Gear "works so smoothly you can't hear it when you're backing"

lliam Selset is a man who knows at it takes to bring in a profitable ibut catch. He's been fishing the ific halibut waters for 47 years, the : 36 as skipper of his own boat. Captain Selset has good reason to proud of his schooner *New Era*. th an overall length of 57' and a ½' beam, *New Era* will carry upds of 60,000 lbs. of iced halibut. r sparkling-clean exterior is augnted by a brand new power plant alled early this year. The new ene—a 195 hp Waukesha Resolute ives *New Era* a top speed of 9.5 ots and an average "day in, day " speed of better than 9.2.

Between the engine and the 50" x 40" prop is a new Twin Disc MG-512 Marine Gear with a 4.15:1 reduction ratio. Here's what Captain Selset had to say about this gear's performance following first trials of the new engine in March:

"The Twin Disc Gear on our new Waukesha Diesel works very smoothly—so smoothly, in fact, you can't even hear it when you're backing. The boat backs as fast as it goes ahead. We had another make of gear on the old engine, and the Twin Disc gear is not only much smoother but far more responsive. It's right there, now!"

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PACIFIC Fisherman's NEWS

SEPTEMBER
1961

Alaska Fishermen's Red Catch Best Since 1948

Alaska fishermen to the middle of gust had caught more Red salmon n they had in any entire season ce 1948—and Reds were still being en in declining numbers.

With some weeks yet to run, the ck at presstime was crowding 2.8 lion cases of all varieties, and was re than 200,000 cases ahead of the ck to equivalent date since 1954.

The season was running rapidly to close—that's true, but only Chums re really weak.

Pinks were continuing to persist, h the Ketchikan district of South- t Alaska giving an occasional hint t fishing might even yet redeem season there from the shame of lure.

icy Strait held up surprisingly well better than the statistics indicate, cause many fish caught there were iled under refrigeration to other tricts for canning, and thus were dited to alien areas.

nadian Catch Generally Good

British Columbia fishermen gener- had good fishing — except for ums. This variety, which has been ak all along the coast for a num- of years, has not rallied with the ers.

In Southern British Columbia poor sea survival of the Sockeye which were spawned in the Fraser in 1957 yielded a disappointing catch.

Pinks bound for the Fraser were just beginning to play a part in the fishery at presstime of this issue.

Puget Sound and southern British Columbia fishing fell about 800,000 Sockeye short of the 4,000,000 forecast as the amount of the permissible catch which could be expected from the Fraser Sockeye resource this year.

Sockeye Sea Survival Poor

● Sockeye run to the Fraser this year was erratic and marked by disappointments.

In the first place, the number of seaward migrants in 1959 — from which the 1961 run returned — was prodigious. A forecast based only on the numbers of downstream migrants would have indicated 1961's run would be among the greatest known; but the International Salmon Commission staff suspected in 1960 that this would not be the case, and that the sea survival of the 1959 hordes of young Sockeye had been very low.

The forecast was for a run of 5 million, with 1 million needed for escapement. At presstime it appeared this would be attained, but that the catch, divided almost equally between the two would only be about 2.8 million.

A Year for Gillnetters

● Beside being comparativley few in number, the 1961 Sockeye were scattered. At least this is the only convincing explanation for the poor fishing found by the seiners and the excellent results for the gillnetters. Purse seining on Puget Sound and in the Canadian Straits fishery has seldom been so poor.

But the gillnetters did well.

The poor fishing found by the seiners, and the relatively low level of the Sockeye catch, led numbers of boats to rush off to Alaska in hope of better fishing somewhere up there.

At the approximate end of the Sockeye season, with Pinks just starting, the American purse seine fleet on Puget Sound, which had reached an actual number of 272 active boats, was down to 175.

Increased effectiveness of gillnets against the 1961 Sockeye, as compared with the 1957 cycle run is shown in the following figures, which represent the percentage of the total

continued on page 15

C. Packers Talk Whaling Deal With Taiyo

Two of the world's greatest fishing mpanies may combine forces next ing in a North Pacific whaling op- tion if negotiations now under way tween British Columbia Packers, ., and the United Fishermen and ied Workers Union are successful. Spokesmen for the company were hopeful that an agreement could be reached that would enable B. C. Packers to proceed with its pending arrangement with Taiyo Gyogyo of Japan. Last year there was no whaling off the B. C. coast.

The company proposed to introduce a new formula for payment to whaling crews based on the volume of high quality meat and oil produced, while the union demanded continuance of the formula based on number of whales caught.

Under the terms of the deal about $2,000,000 would be invested in the improvement of shore facilities on Vancouver Island. Whale meat would be frozen for human consumption in Japan.

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catches of the two countries taken by each form of gear in each year:

Gear	1957 %	1961 %
Canada—		
GN Strait	14.8	22.0
GN River	43.6	51.3
PS Strait	41.6	26.7
	100.0	100.0
United States		
Seines	70.2	59.1
Gillnets	17.9	34.9
Reefnets	11.9	6.0
	100.0	100.0

• Pink salmon taken in the Strait of Juan de Fuca and Puget Sound fishery prior to Aug. 20 consisted almost wholly of fish bound for streams outside International Salmon Convention waters.

Thus 657,000 Pinks—divided quite evenly between the two countries—had been taken in convention waters before the run of Fraser Pinks ever put in its appearance.

Most of these early-running fish appeared to be headed for British Columbia streams tributary to Howe Sound, Jervis Inlet and other Canadian waters. These fish normally run down Johnstone Strait.

Gruening Bill's Backers Seeking Active Support

Advocates of the fisheries fund bill introduced in Congress by Senator Ernest Gruening of Alaska, and supported by 22 other senators fear that failure of fishermen and the fishing industry to voice its endorsement may jeopardize the bill at this session of Congress.

In Pacific Coast states, all of whose senators are believed to be supporting the bill, its passage appears to have been taken largely for granted. From Washington comes word that this is not at all the case, and that only active support can save it.

The bill would double the amount of money now available for research under the Saltonstall-Kennedy act, but would make it available to the fisheries states for research, rehabilitation and fisheries training projects.

Distribution would be in proportion to the value the landed fisheries catch of each state, plus the market value of its fisheries products as prepared for market.

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Built to an Ideal Of Safe Capability In Fishing Alaska Salmon and Crab Around Kodiak I.

Steel Specialist, for seining salmon and fishing King crabs in Central Al Forty-six feet long, she is designed to serve specific purposes in cold stormy seas, and to do it safely and capably.

● Built to satisfy specific requirements of two totally different fisheries at two wholly different times of year—winter and summer:

We're writing about *Brant* and *Falcon*, new steel members of the Alaska Packers Association's great fleet. They're small for Alaska seiners; and they're big for Alaska King crabbers—but that's exactly what the Packers' operating people said they wanted, and what Marine Construction & Design Co., Seattle (living up to its name), designed and constructed into them.

They fished this past summer for salmon, serving the APA Larsen Bay cannery on Uyak Bay; and now are working King crabs for the Packers' Kodiak plant on the eastern end of the island. Each is skippered by a Suryan, Joe on the *Brant* and John on the *Falcon*—both long-time Alaska salmon fishermen.

● Alaska Packers Association wanted steel boats to stand the ice of winter, to provide strength, and freedom from costly upkeep which virtually year-round operation can entail.

Again, they had to be big enough to be profitable seiners; and not too big and expensive for King crabbing. They had to be designed specifically to avoid the perils of winter crabbing under icing conditions; and with carrying capacity for 1,800 live King crabs with an average weight of 11 lbs.

Marco tackled the problem, and *Brant* and *Falcon* are the answers; and correct ones, if one summer's experience can be counted on.

They're 46′ overall; 15′ molded beam; draw 5′. Main engine is a GM 6-71 diesel, freshwater cooled with a built-in keel cooler; and with Twin-Disc manual reverse clutch and 3:1 reduction gear, plus a T-D front-end power take-off. The wheel is a bronze Coolidge, 36 by 29 on a 2½″ stainless steel shaft. This combination gave a cruising speed of 8.5 knots.

Auxiliary engine is a Lister LS-2 diesel, driving a 3 x 3 centrifugal pump and a 1-kw., 32-v. generator. Main engine controls are Mathers wire controls on the engine governor and a Westinghouse air control valve for the manual reverse clutch. Compressor is also Westinghouse.

Instrumentation includes a Wood Freeman Metal Marine Pilot, Raytheon radiophone, Ross Fisherman echo sounder. Dirigo compasses are installed in both vessels.

Deck machinery is all by Marco except for the Kolstrand mechanical drive purse winch. Anchor winch is a Marco hydraulic. The Puretic power block is similarly driven. Purse blocks and davits are Marco's aluminum design.

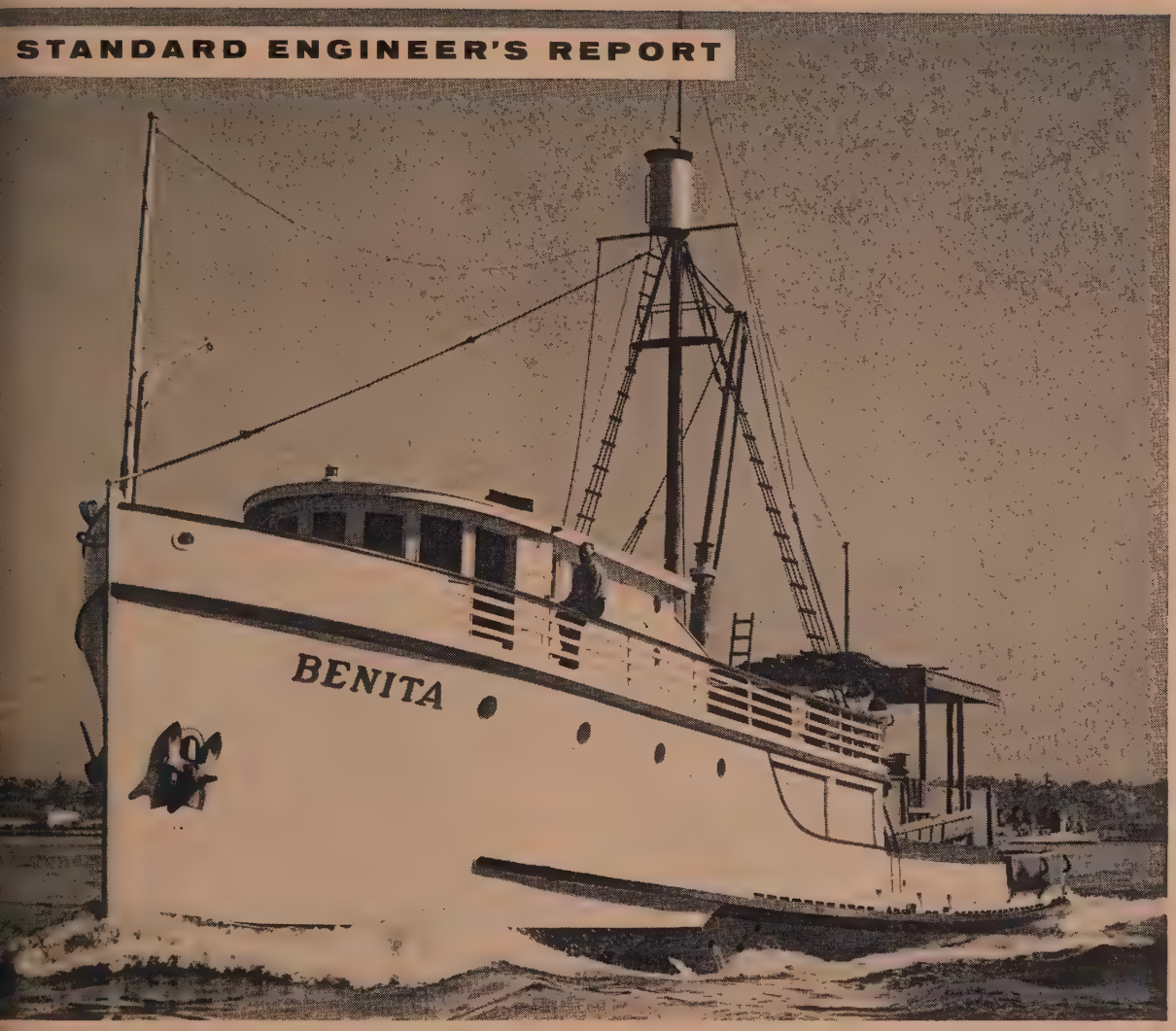
● Safety is a prime consideratic *Brant* and *Falcon;* and special a tion was given to the icing ha encountered by King crab vesse the Kodiak area during the w fishing season. For example, the mast is stepped in the steel house stayed with a bipod to the hou forward instead of the usual shr with their tendency to gather ic

Overflow water from the hold live crabs are carried is discha overboard through a drain pipe tending up into the chimney trun the hatch, under the deck and o the vessel by means of a through fitting. This pipe duct is removed the hull opening closed during mon operations. It keeps the flow water off the deck and red ice formation in winter. The ve have operating freeboard of 15″ the hull is fully flooded for c When operating for crabs, an iliary 2-cylinder diesel drive p changes water in the hold ever minutes.

The steel house and forecastle thoroughly insulated. First they sprayed with an insulating ma then covered with non-flamable rofoam insulation; and this in sheathed with plywood.

continued on pag

STANDARD ENGINEER'S REPORT



Tuna clipper weathers 25 years of rugged duty with no failures...on RPM DELO Oil

e her launching in 1935, the 92-foot clipper, MV Benita, has made -trips a year in Southern waters. t of the trips have been 1000-) miles long. Only RPM DELO vy Duty Lubricating Oil has been l in 25 years operation.

long as I'm her owner," says Matteo tt) Ghio, "we'll be using 'RPM LO' and Chevron Diesel Fuel in the ita. We've given her some pretty rough going down through the years. But we've never had any trouble with piston rings sticking, rust, carbon or sludge. And when the chips were down, the Benita's diesel has never failed us. 'RPM DELO' has kept it in fine shape."

Shipnotes: A 225-horsepower Union engine powers the Benita. She carries two auxiliary engines: An Atlas and a GMC. Up to 100-tons of fish can be stored in the hold.

Marine lubrication problems? Let one of our technically qualified engineers solve them for you. His experience and the wide range of top-quality Standard products assure economical solutions to any lubrication problem.

The free technical assistance of a Standard Engineer is available at all major West Coast ports. For more information, contact any Standard Oil representative, or write: 225 Bush Street, San Francisco 20, California.

RPM DELO

STANDARD OIL COMPANY OF CALIFORNIA

TRADEMARKS "RPM DELO" AND CHEVRON DESIGN REG. U.S. PAT. OFF.

"RELIABILITY SOLD ME ON PALMER ENGINES"

SAYS CAPT. AUGUST LOSSO, skipper of the charter boat "Princess Pat," a twin screw 42-footer out of Brielle, N. J., popular Atlantic Ocean sport fishing center. Tuna, marlin, bluefish and mackerel are his specialties.

"During our busy season 'Princess Pat' is on charter day in and day out—practically without letup. It's a rugged assignment for engines and in my business I can't afford lost time for repairs.

"When I needed new engines I looked them all over and made a point-by-point comparison of construction features and performance reputation. Palmer's record stood out on both counts. I'd always heard about Palmer's fine reputation for reliability. Right from the start I found that re-powering with Palmer has been the smartest—and most economical—move I've ever made engine-wise."

Palmer reliability is available in a wide range of engines —from 8 h.p. to 300 h.p. Whatever your re-powering problem—pleasure or commercial boat—it will pay you to discuss it with a Palmer dealer. For the name of the dealer nearest you and free literature, write: Palmer Engine Company, 619 Bolling Road, Cos Cob, Conn.

A LOT MORE ENGINE FOR YOUR MONEY

Protect your profits wi the extra dependabilit of a MONEL shaft!

Shaft failure can be disastrous when the are running. That's why you need a shaft of stronger MONEL* nickel-copper alloy!

Here's what you get with a MONEL alloy shaft:

- **Extra strength**—MONEL alloy is stronger than stru steel, takes the strain of high speed and heavy work
- **Dependable toughness**—MONEL shafts with shocks of striking objects and the hard pounding o hauls in heavy seas.
- **Greater stiffness**—MONEL shafts reduce whippi vibration—deliver smooth performance.
- **Outstanding corrosion resistance**—MONEL alloy brackish and sea water. Saves you money by prol your shaft's life.
- **Long service life**—MONEL shafts withstand the p ment of day-in, day-out operation—help eliminate da untimely haulouts.
- **See your boatyard or marine dealer** for a quotat a long-life MONEL nickel-copper alloy shaft. *Inco

MONEL

HUNTINGTON ALLOY PRODUCTS DIVISION
The International Nickel Company, Inc.
Huntington 17 INCO **West Virginia**

ilizers Winged Out, and her high freeboard evident, **Brant** runs on e Washington. Note that shrouds are eliminated to reduce danger when g conditions are met.

ront section of the pilot house is structed of stainless steel to offset normal problem of compass devi- n often encountered with a steel se.

hese are among the first vessels built specifically for King crabbing, with planned-in capability for profitable operation on salmon during that shorter season.

With King crab operations growing apace, they may well be the forerunners of a specialized fleet and type.

Ivar Angell Teaches Fishing to Chileans

Ivar Angell, owner and master of the North Pacific trawler and halibut vessel *Kodiak,* in August entered into an agreement under which he will teach North Pacific fishing methods in Chile for the next 18 months.

He will seek to apply North Pacific fishing methods to South Pacific fishing problems.

He is undertaking the assignment under the United States' program of technical assistance.

Cape Blanco Is Center Of Northwest Albacoring

Toward the end of August Albacore fishermen from Oregon and Washington—and perhaps a few from British Columbia—were finding fair fishing well at sea off Cape Blanco on the Southern Oregon coast.

Most of the fish was being delivered to Eureka or to Newport, Ore., according to the Fishermen's Cooperative Association, whose station at Coos Bay wasn't getting much of the fish.

A number of trips running up to 15 tons were delivered to Astoria, averaging about 10 days, dock to dock.

MARCO SETS THE PACE WITH ANOTHER FIRST

Luketa V Type Trawl Doors

U.S. Pat. No. 2 816 385
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Other Patents Pending

HERMEN: You Can Increase Your Production with eta V Trawl Doors!

- Will Not Cross
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Available in Sizes 3½′ x 7′, 3′ x 6′ and 2½′ x 5′, Aluminum or Steel

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Japan Permits 3 More King Crab Operations in Bering

● Surprise authorization for three Japanese King crab fishing and freezing operations in eastern Bering Sea near Bristol Bay in August staggered the six fishing companies chosen by the Japan Fishery Agency for this enterprise.

The announcement came out of a clear sky and only a few days before the permits were to go into effect Aug. 15. They extend until Oct. 20; and have a combined target of 700 tons.

The Agency emphasized that the present authority is for this autumn only, and is to be regarded as a test operation. However, it was felt that there could be little doubt that it would prove a preliminary to further expansion of Japan's activity in this fishery.

Presumption was that the move had political implications, probably being in a manner retaliation against incursion by the U.S.S.R. Bering Sea fleets on the area where ther Japanese this year are fishing shrimp in the vicinity of the Pribilof Islands.

First vessel to get away under the new King crab authorization was *Eishin Maru* of the Hoku Suisan fleet, which sailed Aug. 17. This vessel, a former tunaman, was converted for crab service only a short time before.

The other vessels licensed were expected to get away for the fishing grounds about Aug. 25. Each has a quota, totaling 700 tons for the fleet. They are not permitted to engage in canning, but must freeze their crabmeat. Furthermore, they are forbidden to intrude upon the fishing grounds reserved for the floating cannery *Tokei Maru*, which has been operating in the Bering Sea for years as a joint enterprise of three Japanese companies.

(Editor's Note—Japan's expansion of its Bering Sea crab operations came as something of a shock in the United States industry, as Japanese spokesmen for years have indicated the belief that the previous rate of exploitation was about all the resource could sustain. In 1960 a second Japanese operation was authorized; and this was follo by the Soviet sending a crab exp tion onto the grounds also. The move on the part of Japan imp still further exploitation on the crab population of the eastern Be Sea.

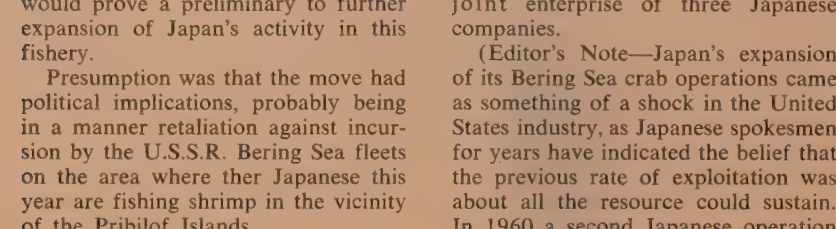
Japan's new interest in King freezing in contrast to canning als received in the United States with prise, as the demand for the ca product is excellent. Moreover, canned goods are not subject to tary inspection in the same degree sometimes has been troublesome frozen shellfish products entering United States.)

Atomic-Processed Fish Marketing Is BCF Study

A study is being conducted by Bureau of Commercial Fisheries the Atomic Energy Commission to termine the conditions under w radiation-processed fishery prod should be marketed in order to vide the greatest over-all benefit the fishing industry—producer, cessor and distributor — and to consumer.

The feasibility of marketing fis products is being discussed by Bu marketing specialists with fish ducers, processors, and distribu along with retail food groups and sumer specialists, such as newsp food editors and extension people.

The Atomic Energy Commissio reserving action on a number of search grants pending the outcom ilar study on fresh fruits and v tables being conducted by Stan University.



CAPTAIN GIL HAMILTON
of the "Tern"

"Sea King Filament Nylon Netting is hard to beat."

"In fact," says Gil Hamilton, owner of the Salmon Purse Seiner "Tern," "I think it is the best. I have used Sea King Filament Nylon Netting for the past five years in Southeastern Alaska, where the water is the roughest and the netting must be right."

You, too, will get these advantages in Sea King Filament NYLON netting — the finest netting ever developed — because of an exclusive "liquiplating" process which makes these advantages possible. Made of duPont NYLON, it's lighter and stronger size for size; easier to handle; knot slippage eliminated; greater uniformity of mesh; cuts replacement cost.

For the finest netting ever developed . . . insist on . . . Sea King Filament NYLON, NYCOT and Sea King cotton netting.

The Fish Net and Twine Company

927 FIRST ST., MENOMINEE, MICHIGAN

Western King's 649-Ton Trip Sets Record

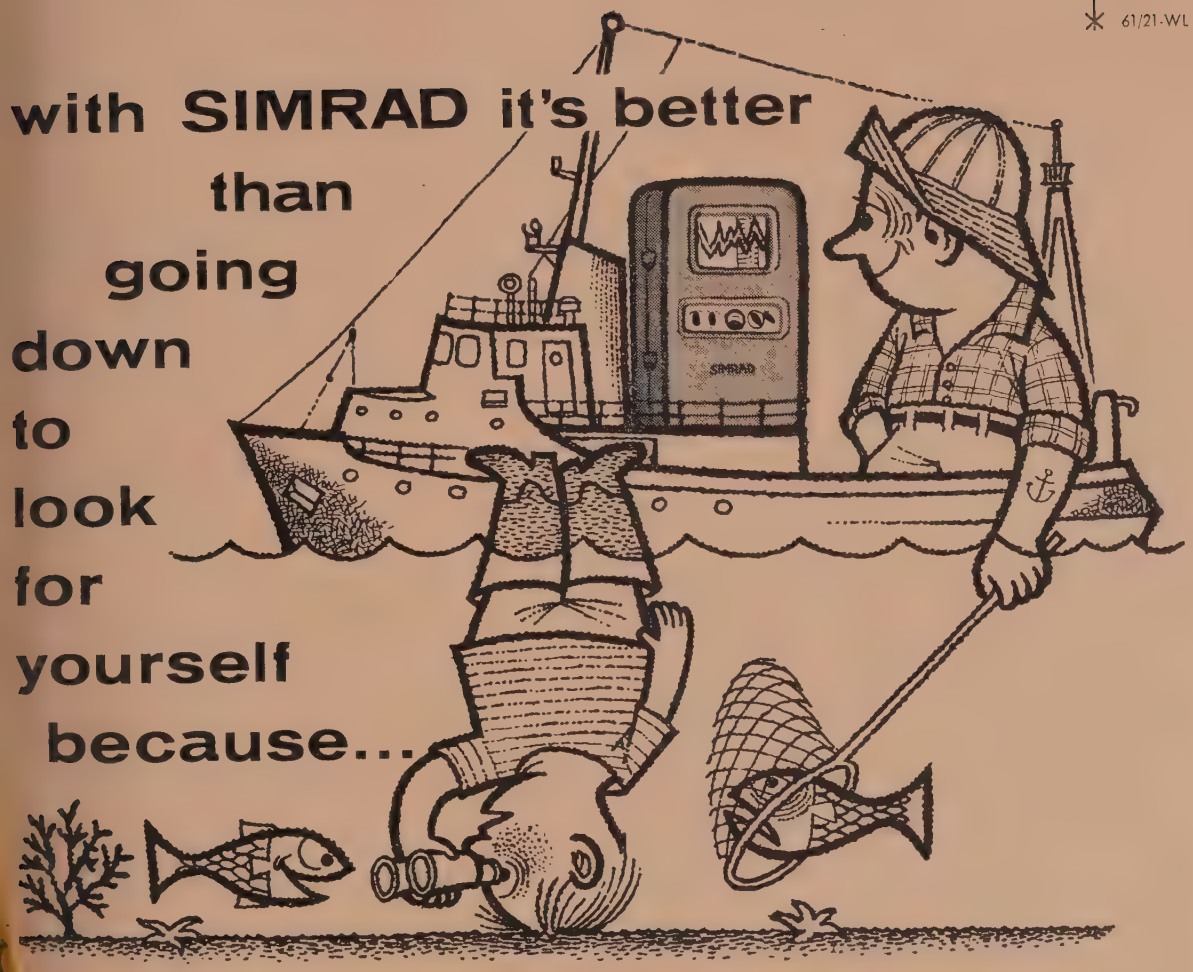
● *Western King* set a new record a single trip of tuna in July when delivered 649.325 tons of saleable t to Star-Kist Caribe, Inc., at Mayag Puerto Rico.

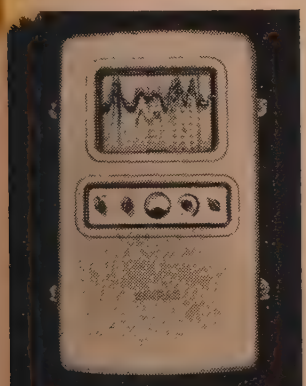
She took the fish—largely Skip —far at sea off Ecuador in a tri only 30 days.

This was *Western King's* sec trip. Her record-breaker erased mark of 630 tons, hung up ea this year by *Western Ace*, a vesse similar size and ancestry, but ope ing under a different house flag.

61/21-WL

with SIMRAD it's better than going down to look for yourself because...





A choice of 30 types covering all sizes of ships, each recorder made for a special purpose.
Depth-ranges for shallow waters as well as deep-sea soundings, down to 6000 fathoms.

The SIMRAD Fish Finding Instruments record everything — even the plancton layers.

The SIMRAD Echograms clearly show the depth and consistence of the sea-bed. You will see schools of fish and single fish and with some experience it is even possible to see what kind of fish!

The SIMRAD WHITE LINE RECORDERS show the sea-bed contour as a thin dark line, immediately followed by a white-line belt.
Every thickening of the sea-bed contour or what is recorded above, represents schools of fish, single fish — or plancton.
For trawling, long lining and bottom fishing the SIMRAD WHITE LINE Discriminator should be used.
For navigation and pelagic fishing, purse seining, mid-water trawl etc., simply switch off the White Line Discriminator and use normal recording.

All SIMRAD RECORDERS may also be combined with SIMRAD SONAR gear for horizontal ranging.

You can't afford to be without a SIMRAD WHITE LINE RECORDER.

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By Courtesy of...

COLUMBIAN RESEARC

About once a year, we feel compelled to break into the persistent of rope makers who claim to be first, foremost and forever with synthetic ropes. To set the record straight . . . the first satisfactory synthetic rope was produced by COLUMBIAN.

World War II really triggered this development of synthetic into a synthetic rope. The Army Air Corps desperately needed strong glider-tow rope. Nylon had the strength but it raveled uncontrollably once cut and kinked badly after being subjected to stresses and strains.

COLUMBIAN researchers came up with the big answer to the Nylon problem.

They developed a *stabilization* process that eliminated unraveling and fluffing, took out 5% to 10% wet shrink and eliminated excessive kinking and whipping. The A Air Corps had a glider-tow rope that trained straight behind the plane. (Although not pertinent to this sto COLUMBIAN also developed a way to lay wire with the synthetic yarns during manufacture thereby affordi breakproof communications between the plane and the glider).

In order to satisfy the urgent demands of natio defense, COLUMBIAN shared this patented process with other rope makers during the emergency p

General Hap Arnold, Air Chief of Staff, sur up the importance of COLUMBIAN's research break-through by stating in a letter to the Com "Without your outstanding service, our air p against . . . (our) . . . enemies could never have been accomplished."

We're proud of that statement. We are proud of the fact that COLUMBIAN has bee is and will be intensely engaged in researc the possibilities of all man-made fibres.

Let any other rope company claim record of firsts. But when it comes to synthetic ropes, COLUMBIAN comes fi

So . . . until we write another advertisement on this same subject next year . . . we hope you will remember . . . that when it come synthetics . . . COLUMBIAN comes first.

ROPE COLUMBIAN TWINES

COLUMBIAN Rope Compa

Auburn, "The Cordage City," N. Y.

Pacific Fisherman's CANNED FISH HAND-I-BOOK

Edition III

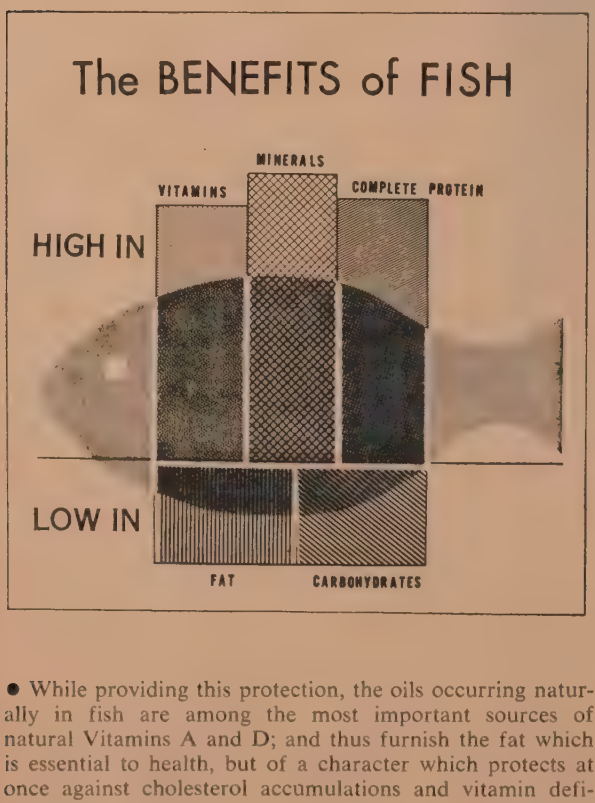
The Facts on Canned Seafoods

Seafoods are Essential–

● This theme runs through modern nutritional thinking.

More than ever before medical research and dieticians recognize the fact and count it fundamental.

One of the great discoveries in the history of nutritional science is the product of the past few years—the finding that polyunsaturated oils found in fish suppress blood serum cholesterol, and thus contribute significantly to prevention of hardening of the arteries—atherosclerosis—and coronary heart disease.



● While providing this protection, the oils occurring naturally in fish are among the most important sources of natural Vitamins A and D; and thus furnish the fat which is essential to health, but of a character which protects at once against cholesterol accumulations and vitamin deficiency.

Fish also provides proteins in what the nutritionist calls "perfect" form. That is, proteins which contain all the *essential* amino acids, the complex molecules on which sound growth depends and strong, young bodies are built.

● With their growth-promoting, health-protecting qu ties, seafoods offer extra dividends of flavor, zest, vari and *color;* the color of adventure, of the sea, of wind wave and boats and hardy men, who dare the storm bring the world's tables some of their most precious foo

Fish are almost numberless in their variety, in contr to the other forms of animal protein foods. They l themselves to a thousand variations of preparations serving, hot or cold, rich or lean, traditional as chowd exotic as bouilliabaisse.

● All fish and sea foods share the advantages of healthf ness, nutritional essentials, flavor, variety and zest.

To these qualities canning adds *convenience,* and *prot tion.*

Canned fish is ready in an instant, and provides all desirable qualities which fish bear as they come from water, stabilized, protected and made available on a ment's notice, at any time and place, desirable alike un the pressures of emergency or the painstaking preparat of the epicure.

● For almost 60 years PACIFIC FISHERMAN has served fishing industry and, through broadening understanding the fisheries, and their products, perhaps has served a the myriads who enjoy fish, as well as those who ca and market them.

In particular it has been the privilege of this journal be the special advocate of canned fish and fish-canning.

Twice before we have published PACIFIC FISHERMA *Canned Fish Hand-i-Book,* whose two editions, printed hundreds of thousands of copies, have served alike industry and public as the standard source of informat about the canned foods which come from the sea.

● Now, in its Third Edition, and in the expanding inter tional character of PACIFIC FISHERMAN, the *Hand-i-Bo* touches on new technology, looks to the new horizons health and nutrition opening before Mankind.

Here are the facts about canned fish, not for the sci tist, not for the technologist, but in the language of consumer and the man who sells to her; in the terms of teacher and the student, the young mothers whose shopp carts carry no better bargains, no groceries more essen to the healthful diet than canned sea foods.

FIRST SALMON CANNERY IN THE UNITED STATES

his sketch of the world's first salmon cannery, operated on the Sacramento River, Calif., in 1864, was made for **acific Fisherman** in 1903, the artist working under the personal direction of G. W. Hume who, with his brother Villiam and A. S. Hapgood, established the industry in this primitive plant.

Seafoods Came First

In American Canning

Sea foods were the first foods to be canned in the United tates.

In 1819, just 10 years after Nicholas Appert completed is invention of canning in France, Ezra Daggett and homas Kensett started canning oysters in New York City. year later, and William Underwood was canning lobsters Boston. The name and brand of Underwood is a famous ne in New England to this day.

These were small ventures, however, and it was not until 844 that Kensett established a really substantial oyster anning operation in Baltimore.

Canning came to the Pacific Coast 20 years later, in 864, when three New Englanders, George and William lume, and A. S. Hapgood, began canning salmon on the acramento River in California.

Their enterprise was stimulated by powerful factors, the ivil War, and the seasonal availability of choice and per- hable food in volume far beyond the current consuming apacity of the immediate market.

Then as now, a century later, fish and sea food was esirable in the diet. It was seasonal in availability, and nus needed to be canned if the crop—planted and grown y Nature—was to be used fully and without waste. More- ver, much of the best material came from the distant oasts, often too far from the consuming markets to be vailable unless protected by cans and canning.

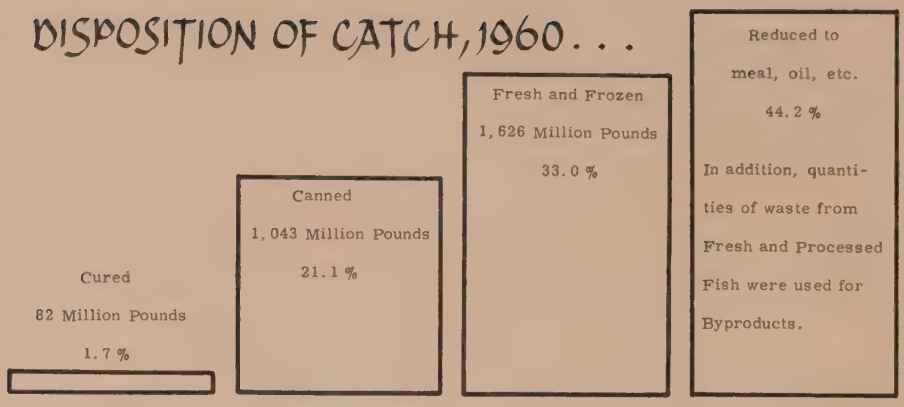
Modern development of refrigeration has not reduced the employment of canning, but rather has made sea foods further available in frozen form— while the quantity of fish and sea food canned each year is almost always larger than ever before.

Such popularity is due to many causes beside increasing population. Among them, increasing knowledge of the health-benefitting qualities of sea foods, of their perfect proteins' contribution to nutrition and growth; appreciation of the convenience and cleanliness of canned fish; and love of its variety, flavor, zest, and the "color" of the sea and of the boats and men who catch the fish.

● Sea food canning makes a significant contribution to the economy of any nation where it is well developed.

This contribution may be either in the domestic food supply, as in the case of the United States, where consumption exceeds even the great production; or it may be through the export trade, where canned fish are important earners of exchange, as in Japan, Canada, Peru and South Africa.

But most significant of the contributions which seafood canning makes to the *economy* of countries where the industry is developed derive from (1) the more complete use of the marine resources which canning makes possible; and (2) the great increase in economic return resulting from the value added by manufacture in the canning process to the relatively low value of the raw material where



Seafood Canning adds greatly to the economic value of fishery products in the course of manufacture. Thus, while only a little more than one-fifth of the present day total gross catch of fish and seafoods goes for canning, the value of the goods as sold accounts for a substantial part of the total income derived from the world's fisheries.

canneries and enterprising canners are not available to give it permanence and standing in world markets as an essential food and appreciated delicacy.

Value of canned sea foods packed in the United States in 1960, stated at the wholesale value received by the packer, was $383,321,000, of which tuna, with $172,678,000 was by far the largest item. Salmon, with $84,717,000 was an easy second. Canned shrimp, $16,920,000, was third and Maine canned sardines a close fourth with $16,699,000.

● Several factors strongly influence the degree to which the foodfish supplies of the United States are prepared for use by canning.

Out of 2,751,000,000 lbs. of fish used for food in the United States in 1960, 1,043,000,000 lbs. were used for canning, producing 872,000,000 lbs. net weight of canned food. Details of raw material use and resulting product are given in an accompanying table.

What are the several factors which see a large percentage of the American foodfish production prepared as canned fish?

● *Perishability*—Sea foods are notably perishable. They must be used fresh, or their freshness protected immediately. Of the American foodfish catch which is not eaten fresh—and thus usually very close to point of landing—much more than half is packed in cans.

Thus canning, with its ability quickly to capture the freshness of the fish as it comes from the sea; and to keep it sound and clean and wholesome for a period of years, has been specially applicable to sea food preparation.

The delicacy, the flavor, the zest of fresh fish may fade quickly; but in canning they are caught and kept for f wholesomeness and appeal.

● *Seasonal availability*—"Fishing seasons" are often i posed by Nature as well as by conservation officials. Ma varieties of fish are available to the fishermen for o short periods, and during these seasons the catch is tremely high. The fish must be canned or frozen quic or they will be lost, and the fisherman—and the public must forego the benefit of the seasonal resource.

Canning offers the ideal alternative—and in recent ye freezing has come to share much of the responsibility safeguarding these splendid foods from the sea and p viding full economic recovery from the seasonal natu resource.

Canning, with its large capacity, and the ability of process to protect the quality of enormous quantities fish in a short time, well serves the food and health quirements of Mankind; and at the same time enab Man to make the fullest economic use of the resources the sea.

● *Localized occurrence*—Seafood resources usually concentrated in their economic availability.

Fish of marine origin obviously are most readily av able along the coasts; and concentrations there may be f ther influenced by latitude, ocean currents and tempe tures; and the catch by harbors and facilities, and th relation to railroads, highways and water transport to interior.

Such general concentrations favor the development large and thoroughly modern canneries, capable of pack any quantity of fish which may be anticipated, and w economic advantages arising from volume operations a strategic position with respect to transportation—adv tages which are reflected in favorable prices to the c sumer.

● *Remote occurrence* frequently is a factor in sea fo canning, although modern refrigeration has served to duce its influence.

Salmon is the most notable example of remoteness natural habitat affecting the development of the indust and the Alaskan salmon fisheries are the prime instance this connection. Even to this day a large part of the worl Red salmon are canned in remote areas of far western, northern Alaska; or in sub-Arctic mid-Pacific; or along coasts of Kamchatka, in extreme northeastern Asia.

● *Canning* is the most effective answer to the problems full utilization of sea food resources under these conditi of perishability, seasonal availability, localized concent tion and remote occurrence so characteristic of ocean f and shellfish.

Value of Canned Fish and Seafoods Packed in U.S., 1934-1960

(In thousands of dollars.)

Year	Value	Year	Value
1960	383,321	1946	227,619
1959	348,251	1945	152,800
1958	388,582	1944	152,914
1957	335,829	1943	141,189
1956	349,516	1942	144,997
1955	303,165	1941	138,684
1954	331,018	1940	94,182
1953	306,874	1939	96,627
1952	305,829	1938	83,446
1951	301,210	1937	105,175
1950	331,335	1936	94,564
1949	295,504	1935	74,999
1948	336,181	1934	80,021
1947	310,679		

—Source: U.S. Bureau of Commercial Fisheries.

9 Great Canned Sea Food Leaders

While the process of canning is applied to many, many rieties of fish and sea foods, there are perhaps not more at nine distinct leaders by virtue of their volume and ple character.

These generally are of international acceptance, used many countries. Thus in essence the world's canned sea od industry depends in large degree upon the simple, ndardized, staple methods of preparing:

Tuna, Salmon, Sardines, Herring, Mackerel, Oysters, ams, Crabs, Shrimp, and specialties produced from these sic varieties.

There are the principal canned sea foods to which this ition of PACIFIC FISHERMAN'S *Canned Fish Hand-i-Book* ll be devoted. There are others of national or regional portance, but these are the items which enter into inter- tional trade, or whose volume grants them unquestioned e-eminence.

These are human foods; but to the list properly one ore item should be added: canned pet foods consisting holly or in large part of fish.

Properly canned pet food should be included from several andpoints: On the basis of quality it is wholesome, sound d good, and is protected by the same laws which forbid e use of spoiled or contaminated material in human food. volume it is gigantic—8,783,271 cases of 48 lbs. each. value it reaches the astonishing level of $43,961,000.

Tuna Stands First

Tuna readily ranks first in United States canned fish, d probably can be accorded that rank on an international sis.

Certainly it is the fastest-growing factor; and that with e greatest apparent potential for growth.

The United States is the pre-eminent producer of canned na; and by all odds also the greatest consumer.

Japan readily ranks second in tuna canning, although it es only a relatively small portion of its tuna landings for nning. Much of its production is frozen for export and nning in other countries, notably the United States.

The growth of tuna canning, and the wide, bright hori- n of its future are among the romances of sea food nning, and will be discussed extensively in the pages to me.

Sardines in a Nut Shell

Sardines' variation in size often gives rise to the question: Just what *are* sardines? Why are some quite large and hers tiny? Why are some packed in oil? And others in uce? Why are some packed in the can without apparent ldition of anything but salt?

Fair questions, all of these; and they arise from the fact at the term "sardine" basically means a method of pack- g, rather than a variety of fish.

Thus a sardine generally is of the herring family—though ecifically it may be a herring, pilchard, brisling or sprat. ll are packed, and quite legitimately, as sardines.

Beyond that, the sardine method of packing generally volves small fish from which some of the moisture has een removed by drying or smoking or pre-cooking; and which are packed tightly in a can, with or without the addition of oil or sauce.

Most sardines are packed in Europe, notably in Norway, although France, Portugal and Spain make notable contributions.

American canned sardines are much larger in size than those canned in Europe. In Maine small herring are used in the sardine pack, oil often being added.

California sardines, which no longer are produced in the volume of former years, are packed from pilchards, and generally in 1-lb. oval tins with tomato sauce; or in 5-oz. tall round cans with the addition only of salt.

Salmon an Early Favorite

● Salmon was the first *fish* to be canned in considerable volume—earliest canned sea foods were shellfish, remember.

Salmon canning to all intents is localized on the Pacific, for while there are some salmon in other parts of the world their numbers are so small as to interdict canning in significant volume.

Salmon for canning is confined to the Pacific, and by the temperature barriers which restrict this species to the *North* Pacific, north of the 45th parallel of latitude.

Moreover, salmon depend in their intriguing life history upon fine, cold, fresh water streams. There they are spawned and reared. Lacking them, and lacking escapement of mature fish adequate to seed the streams, salmon disappear. Here is a romantic resource, which we shall examine closely.

Herring, Most Numerous

● Herring are said to be the most abundant fish in the ocean, and are found in enormous quantities throughout the northern seas. Related forms abound in the tropics and sub-Antarctic; and there even are fresh water herring in some of the great lakes of the world.

For all their abundance, and for all the substantial quantities which are canned, this process with which we are concerned uses only a small proportion of the world's annual herring catch.

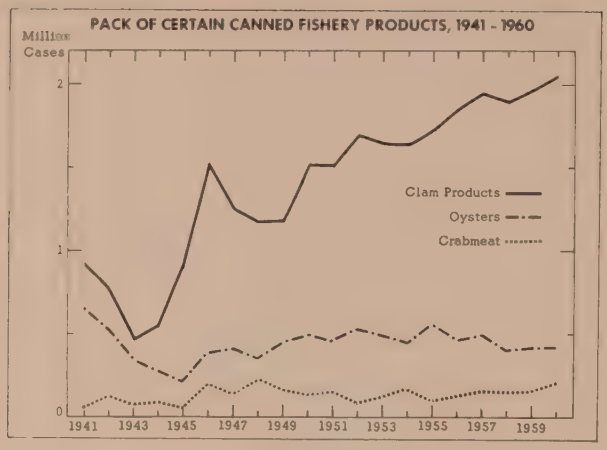
Mackerel, for Potential

● Among the varieties of fish which in the future may be called upon to supply increased quantities of the world's canned seafoods are the mackerels.

On the Atlantic coast of the United States the mackerel is rarely canned, being more esteemed either fresh or salt.

In the Pacific, on the other hand, the principal outlet for the mackerels is in the can. Two varieties are packed; Pacific mackerel, which is a true mackerel in all respects; and Jack mackerel, a closely related species of similar characteristics.

The canned mackerel of commerce is a low-cost, high-protein, nutritionally-rich food for the mass markets.



The Shellfish Leaders

● Shellfish were the first sea foods to be canned in the United States, and still represent a substantial segment of the business, although they have never attained the enormous volume of the packs of tuna, sardines and salmon.

Oysters, both Atlantic and Pacific, are widely canned.

Clams have risen in recent years to new importance among United States canned sea foods. This growth traces directly to the discovery that clams abound some distance to sea off the Atlantic Coast; and the development of methods by which they can be harvested economically by means of dredging.

On the Pacific Coast, where clams still must be harvested by hand, and are much smaller than the Atlantic sea clams, costs are high and supplies relatively limited. This places the Pacific clam canner in an extremely difficult position from which to compete with Atlantic and imported canned clams—and this in spite of the superlative quality of Pac razor clams, generally acknowledged as the finest of product.

● *Crabs* which rank in primary importance in the Un States canned sea food production are three:

King crab, the giant of the sub-Arctic seas, whose and-white meat in large pieces makes the product a favo around the world.

Pacific or *Dungeness crab,* is canned along the Pac Coast.

Blue crab, the standard of the Atlantic coast of No America.

● *Shrimp* canning was for many years the mainstay of United States shrimp business, but the rise of freezing packaging techniques reduced the proportion of Ameri shrimp production going into cans.

The astonishing popularity of shrimp, however, has k the canned pack of this delicacy close to an annual aver of 1 million standard cases of 48 cans of 5 oz. net wei

● *Lobsters,* along with oysters, were among the very sea foods to be canned in America. Some canning still sists, in Canada, but true lobster now is marketed alm wholly in fresh or frozen form, and very largely as liv *truly alive*— lobsters for the epicurean trade.

In southern waters, notably South Africa and Ch *rock* or *spiny* lobsters are still canned in some volu generally under the trade name of *Cape Lobster* or *R Lobster.*

● These, then, in thumbnail sketch form, are the princi canned fish and sea foods which we shall consider m fully in this Hand-i-Book. All of them to some degree least also appear in canned specialties, such as can tuna and noodles; canned smoked salmon; boneless fil of sardines; clam chowder; shrimp bisque, and other d cacies.

Canning—Just what IS canning?

● Canning generally can be defined thus:

Preservation of food through sterilization by heat in an air-tight container.

In the enormous majority of canned fish and sea foods the air-tight container is made of tinplate; but foods may be "canned" in glass packages as well; and aluminum is beginning to come into slowly increasing use—particularly in certain branches of sea foods canning.

Prepared by various processes, fish and sea foods are placed in containers capable of being sealed hermetically. Salt, and sometimes other seasoning or flavoring condiments, sauce or oil may be added.

Tightly sealed, the container is cooked under pressure until the contents are sterile, and thus protected against deterioration so long as the container remains tight and unpunctured.

All the wholesomeness, all the original freshness, is cooked in. Even the bones, when they remain in the fish going into the can, become edible and contribute significantly to the nutritive value of the contents.

Cleanliness of the product is assured so long as the package is not opened.

Life of properly canned fish and shellfish can be counted in years. It is true there are changes which take place canned fish—changes of a chemical nature—and over a period of years they produce variations in text and flavor which, while not unwholesome, impair the m ketability of the product.

Thus, while canned fish and sea foods are protected fr deterioration for a period of years, they should not expected to maintain their full original quality after und extended storage.

Fish and sea food canning processes are carefully c trolled to the end that the wholesomeness of the prod shall be protected and its flavor and attractiveness retai fully.

Preparation of the raw material must be done imm ately, carefully, and with scrupulous attention to qual Painstaking accuracy in weight is vital to legal and c sumer satisfaction. Fill of container bears the utmost portance in the attractiveness which influences consu reaction. The can must be clean and sound, its closu positive. *Above all, the heat processing must be adequ for complete sterilization*—and a little more than tha while not so excessive as to impair texture, flavor attractiveness.

Yellowfin tuna—

ainstay of light meat tuna production, this handsome fellow in his prime for canning is 40 to 80 lbs. in weight. e is taken in warm seas throughout the world, particularly in the Pacific west of North and South America.

TUNA is TOPS

In canned sea foods

Tuna stands today as the most important item among e canned sea foods.

In the United States it exceeded salmon in value in 952, and has continued since to increase its leadership. Although canned tuna has stood at the top for only a ozen years, tuna as such has been considered a delicacy nce the great days of Greece.

Ancient pottery in the famous red-and-black type of the ncient Greeks shows tuna being prepared for the tables of e Epicureans; and we know that the "tunny," as it is still alled in the Mediterranean, was a favorite food in Rome, hen Rome was mistress of the world.

Tuna has played a part in world history, and it is a fish nown throughout the warmer seas of all the world. Some ecies venture north in summer as far as Norway and ova Scotia, and the southern islands of Alaska; but in eneral tuna in abundance and throughout the year is und principally in the tropics and sub-tropics.

The greatest fisheries lie along the western coast of the uthern United States, Mexico, Central and South Amer-a; in the western reaches of the Central and South Pacific, nd north to the islands of Japan.

Of recent years the far-ranging Japanese fishing vessels have found rich fisheries for tuna in the Indian Ocean; and more recently in the Atlantic off the great bulge of Africa, and in a broad belt along the Equator west from Africa to the coast of South America.

So tuna is a resource of all Earth's warmer seas.

● Tuna is a far-ranging fish, travelling fast and widely over the sea.

Thus it is known as a "pelagic" fish; a species of the high seas, spawning, developing and maturing in the ocean, generally far from shore. True it is that the great tuna fisheries often are close to continental coasts, or those of great islands, but it is probable that this is because oceanic conditions of up-welling and current here concentrate the food of the tuna, and thus the tuna themselves. In general, the tunas' life histories are associated with the wide, warm seas.

These are enormous pastures and they support populations of tuna beyond Man's concept. Only a portion of them are utilized today, and the tuna resources of the sea appear adequate to support a fishery much larger than that which today provides a pack of 15 million cases a year in the United States alone.

● Most tuna is canned, although Japan—whose catch of tuna is the largest in the world—uses a great deal of its catch dried and cured, or eaten fresh and raw.

Besides its heavy domestic consumption of tuna, Japan is an important exporter of canned tuna, packed both in oil and in brine; and of frozen tuna, shipped to other countries for canning there.

Thus Japan is readily in second place among the world's tuna canning countries, with France, Italy, Spain, Peru, Chile, Australia and Senegal occupying lesser roles.

● What is the potential of canned tuna?

This is something no man knows today, for there is as yet no measure of the size of the supply. The Atlantic fishery is only just beginning; and that of the Indian Ocean is only a few years old. Man has not yet learned to measure the abundance of tuna, nor to determine accurately the age and rate of growth of the fish—essential research tools in determining the condition of a fishery.

This much is sure: there is no present evidence that the fishery is near its peak.

In the Pacific scientists of the Inter-American Tropical Tuna Commission and of Japan study the tuna closely, in order that changes in abundance may be detected in advance of becoming manifest in depletion, and so measures to guarantee sustained yield may be adopted, if they become necessary.

Thus the great newcomer among fisheries gives proof that lessons which have been learned the hard way in other heavily exploited fisheries have not been forgotten in tuna's great growth.

In the Pacific along the tropical coasts of the Americas the Inter-American Tuna Commission, composed of the United States, Costa Rica, Panama and Ecuador, has found that the Yellowfin tuna fishery in the waters under its study approaches the level of maximum sustainable yield; but that the fishery for Skipjack, the other princ species of this area, takes only a fraction of the an catch which could be taken within the strict pattern sustained-yield conservation.

Thus of tuna's growth potential and the condition of resource, this may be said with confidence:

There is as yet no evidence that either a plateau or p is being approached; but the fishery is under cons study to design and apply conservation measures, sh they ever appear necessary.

● Japan is by far the largest tuna-catching nation in world.

The United States far out-ranks any other nation tuna canning, and consumption.

This apparent anomaly arises from the fact that Ja uses a very large proportion of its tuna landings for poses other than canning: 1, for use fresh in the dome market; 2. for use domestically in cured and dried fo 3. frozen for export.

The United States, on the other hand, uses its entire t catch for canning and in addition imports very large qu tities of tuna in frozen form for canning in American pl to supply the extraordinary appetite of the American m ket for canned tuna. These imports consist in large de of Albacore, the white meat tuna of which the Un States' production does not satisfy the demand.

Relative rank of other tuna fishing and canning nati is obscure. In several instances recent rapid rise in t fisheries of some countries, notably those of west Afr has far out-stripped the statistics by which they are counted.

Among the nations with growing tuna fisheries, mos them new, are: Senegal, Ghana, Sierra Leone, South Af Australia, France, Portugal, Spain, Italy, Peru, C Ecuador, Brazil.

The 5 Main Varieties of Tuna

● Tuna are classified scientifically as members of the mackerel family; but in the mind of the average consumer and distributor of canned fish it is the other way around.

In any case, these are swift swimming fish, beautifully streamlined, from their pointed noses to their slender, tapering tails and crescent-shaped fins. The bodies are round in section, firm and strong. Some of their fins actually fit into recesses in the body, to be out of the way when not needed.

● There are two broad classifications of canned tuna—White Meat, which in the United States may be canned only from Albacore; and Light Meat, which is canned from Yellowfin, Bluefin, Skipjack, Big-Eye and Little Tuna.

As might be judged from the designations, the principal difference between these two great divisions of canned tuna is basically one of color, although distinctions of texture and flavor are also important.

White meat tuna is characteristically light in color, which may range from a light pink to creamy white. The texture is definitely firm; and the flavor generally bland.

Light meat tuna, which is by far the larger of the two broad categories, has minor distinctions, as the species vary one from the other to a limited degree, and are never mixed in the packing.

Color of Light Meat tuna is a light tan, often with pinkish tones. The texture is softer than that of White meat tuna, and the flavor fuller.

● *Yellowfin* is the outstanding tuna in the canned p

Scientifically the Yellowfin tuna is most comm known as *Thunnus macropertus,* although more mod scientific thought advocates *Thunnus albacares* as a be and senior term. It is definitely a fish of the warmer s and is taken between the tropics around the entire wo with major fisheries in the eastern Pacific from the latit of the Gulf of California south to northern Chile; v across the Pacific in a broad belt along the Equa throughout the islands of the East Indies. Large Yellow fisheries were pioneered by the Japanese in the Ind Ocean; and again off the west coast of Africa, and in Atlantic equatorial belt running across the ocean f Africa to South America.

Yellowfin range in weight from about 30 to 200 pou or more; but the larger sizes are rarely or never used canning, as they tend to be dark in color and tough texture.

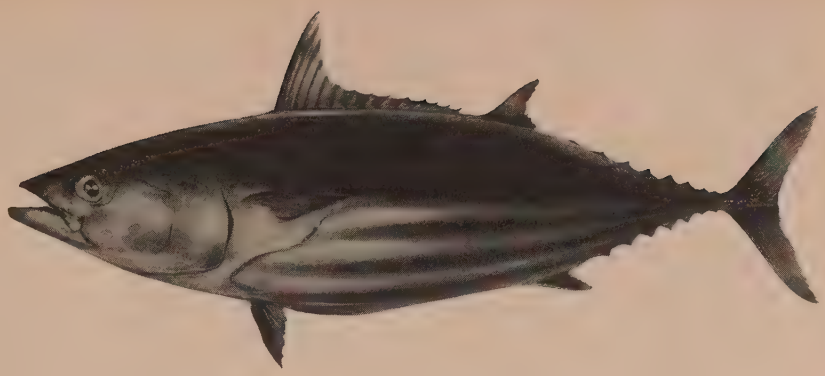
Prime sizes for canning are generally considered from to 100 lbs.

● Skipjack is a small tuna, distinguished by parallel str running along the lower sides of the fish. Weight gener runs from 6 to 12 pounds, although in some areas, nota the seas around the Hawaiian Islands, weights of species to 30 pounds are common.

Although the Skipjack is small, color of the canned f is often darker than some of the other species qualify

kipjack tuna—

allest of the true tunas, Skip-k is perhaps the most abun-nt numerically. Weight usually nges from 6 to 12 lbs., al-ough in Hawaiian waters the erage would be near 18 lbs.; d 30 lbs. weight is often ached.



r Light Meat tuna classification; and the flavor is quite stinct. Skipjack texture is soft and tender.

Skipjack are taken commercially along both sides of the cific. Scientifically it is most commonly known as *atsuwonus pelamis,* although recently there is a tendency term it *Thunnus pelamis.* It is characteristic of the ecies that it is taken best by means of live bait, although e increasing American purse seine fishery succeeds in tching this species to a notable extent.

Bluefin is an unpredictable tuna. It is the variety es-emed of sportsmen, and is sometimes called the Leaping una. It ranges far north in summer, being taken commonly Norway and Nova Scotia coastal waters. Scientifically e Bluefin bears the name *Thunnus thynnus.*

Although taken readily by sportsmen, the commercial tch is always made by means of nets, either seines or aps.

In the Pacific the Bluefin appears off Southern Cali-rnia, the abundance varying widely from year to year. A luefin, perhaps actually a sub-species, is principal species ken south of Australia, and is counted upon as the foun-tion of the tuna industry gradually building in that con-nent.

In color Bluefin is relatively dark, with distinctive flavor. these characteristics it compared quite closely with e Skipjack, although the texture more closely resembles at of the Yellowfin.

In the Atlantic the Bluefin run to very large sizes, but e Pacific Bluefin rarely exceed 80 lbs., and thus are prime r canning.

Big-Eye tuna closely resembles the Yellowfin, and can e distinguished only by rather careful observation. Only recent years has it been recognized commercially as a stinct species.

Because it is so similar to the Yellowfin, and yields a product which is indistinguishable, the Big-Eye tuna commands the same price. Scientific name of this Big-Eye species is *Thunnus mebachi.* It is taken generally in association with the Yellowfin, and seems to be more abundant in the western Pacific than on the eastern side of that ocean.

● *Little* tuna or *Little Tunny* is a small species taken only in the Atlantic. As a species for canning it suffers from its small size, which tends toward reduced economic recovery; and also from the dark color of the canned flesh, which sometimes has trouble in qualifying as Light Meat tuna under the U.S. federal standards.

● *Albacore,* the sole tuna acceptable in the United States under the term White Meat tuna, is known scientifically as *Thunnus germo* or *Thunnus alalunga*—the scientists, as is often the case, disagreeing.

The species is distinguished outwardly by its extremely long pectoral fins, giving it the name of Longfin tuna among many fishermen. Its flesh canned is firm and light in color, the flavor mild.

This species is often taken well to the north in summer, and usually has been considered a tuna of the temperate rather than the tropical seas. Of recent years, however, the Japanese have found large quantities of Albacore in equatorial waters to the westerly of Samoa; and also south of the great bulge of Africa into the Atlantic.

Albacore are found seasonally along the coast of North America from mid-Mexico northerly to Southern California in greatest abundance, and in late summer usually occur north to the latitude of Puget Sound. Rarely the tuna of this species has been taken as far north as Southeast Alaska.

● The Albacore is highly regarded for canning, and as the annual catch is relatively limited, White Meat commands top price among the tunas on the grocer's shelves.

Albacore tuna—

Only Albacore is permitted by United States law to be labelled "white meat" tuna. Its flesh is lightest in color of all tunas—although a very pale pink, not actually white, as halibut is white—and is particularly firm. The flavor is bland and delicate.

Bluefin tuna—

Sportsmen take this tuna in North Atlantic, where it reaches great size; but the Pacific Bluefin used for canr are much smaller. They are lighter in color of the canned flesh, and tender in texture. This light meat tun caught commercially only with nets, and generally in cooler waters than other light meat species.

How Men Catch Tuna

● Tuna are caught commercially by five methods: seining, longline, live-bait, jigging and traps.

Which method is employed depends on a number of factors: 1, habits of the tuna in the area fished; 2, species of the tuna there available; 3, season of the year; 4, traditional preference of the nationality or lesser group of fishermen concerned; 5, size and type of boats available; 6, distance from shore of the area of fishery; 7, presence of small fish suitable for live bait.

● Among the most dramatically revolutionary changes which have ever taken place in a short period in industrial fishing is that which in the five years from its barest beginnings in 1956 had completely changed the character of United States tuna fishing by 1961.

Millions were spent in converting magnificent clippers or bait-boats to purse seining; and out of the change came new prosperity for the American fleet. The effect of the change went far beyond the American fleet itself and had repercussions on tuna fishermen throughout the world, as the Americans were able profitably to recapture a portion of their domestic market which had been lost to lower cost imported tuna.

This extraordinary change in tuna fishing commanded virtually all of the June, 1961, issue of PACIFIC FISHERMAN. For technical details of the methods and equipment employed, and the economic conditions which influenced the overturn, the reader is referred to this authoritative report.

● Tuna purse seining depends for its success primarily upon enormous nets constructed entirely of nylon webbing and lines, very long, very deep, very strong, and fished by powerful vessels, some of which are capable of carr more than 600 tons of tuna in refrigeration.

A school of tuna is detected in the sea, by the co tion of the surface above the school, by jumping fish birds attracted to the small fish on which the tuna feeding—

Then the vessel sets its net in a great circle about school. Once the fish are encircled, the bottom of net is closed by pulling on a steel cable running thro rings along the bottom of the net. Eventually the fish crowded close together as the circle closes, and they "brailed" into the fishing boat by a gigantic power oper dip net.

The net is hauled, handled and loaded aboard agai means of a "power block," usually driven by hydra means, and operated from the boom point high al the deck of the vessel.

This method has achieved success because, by combi the advantages of power block and nylon net, it prov a cheaper means of catching tuna in quantity; becau eliminates the bait problems of the clippers, and bec modern nylon nets are strong enough to resist tearing u the attack of sharks as they seek to feed on the ne tuna.

Where America tuna fishermen were in economic st a few years ago as they sought with their clippers to c pete with imports, the purse seines have restored prosp with larger catches made more quickly, and hence n cheaply.

● Longline fishing for tuna is the favorite method of Japanese, and may produce a larger tonnage of tuna any of the other four methods.

It consists of fishing with a long, continuous line sus-
nded from the surface at a productive level by means
adjustable buoys. At intervals along the longline are
roppers," each terminating in a baited hook.

The fishermen determine the depth most tuna are favor-
g—probably doing this by means of a specialized echo-
under. Then the length of the buoy lines is set for this
pth and the gear—miles and miles of it—is set to fish
here the tuna are feeding.

Live bait fishing is the method employed by tuna clip-
rs, and the Skipjack fleet of Japan.

Vessels fishing with live bait are equipped with bait tanks
d wells through which seawater is constantly circulated.
ey are obliged first to catch small sardines or anchovies
means of nets. These fish are then transferred to the
nks and wells, where they can be kept alive for a period
weeks by skilled and careful handling—and some luck.

With live bait aboard, the clipper seeks tuna, and gathers
e school to the surface about the fishing vessel by scat-
ring live bait fish on the sea. The fishermen, working
ith strong poles and short lines, use either baited hooks
those armed with lures to hook the tuna and jerk them
oard. Where the fish are not too large, they are taken
one-man rigs; but when the fish are too large for one
an to handle other poles are bridled to a single hook until
times as many as four men are fishing one hook in a
autiful demonstration of timing and teamwork.

Jigging for tuna is confined almost entirely to Albacore
shing, although it is often employed by cruising vessels as
means of scouting.

Actually jig fishing for Albacore is a form of *trolling*,
d should not be confused with jigging for cod, lingcod
d other deep-swimming species. The jig itself is a lure,
ften made of plastic and feathers, and frequently with
exible colored strips or realistic rubber tentacles to resem-
le an actual squid.

In tuna jigging the lure is trolled rather rapidly near the
rface and on lines much shorter than are customarily
sed for salmon. Jig boats often are actually salmon trolling
raft re-rigged in varying degree to meet the needs of tuna
shing. They range from small craft with one man to
oats up to 70' or more and fishing with five or six men
the crew.

Operations of this sort are usually conducted relatively
lose to shore and delivery ports, making crushed ice stow-
ge adequate to protect the catch.

● *Trapping* of tuna is a minor factor in production for tuna canning. It is used in taking the great Bluefin tuna of the Maritime Provinces of Atlantic Canada; and to some extent along the Pacific Coast of Japan; and the northwest coast of Africa.

The floating traps are set to fish from coast or island shores at times and on routes which the tuna have been found to favor in their migrations.

● Refrigeration plays a highly important part in all tuna fishing, and for a variety of reasons—most of them associated directly with the fact that tuna are found in warm seas, under tropical conditions. Surface water temperatures in tuna areas are often 70-80° F. Moreover, they are large fish, and are usually taken while they are actively feeding. Thus it is specially important that the temperature of the catch be brought down as rapidly as possible, and that refrigeration drive natural heat from the very center of thick-bodied fish. To chill the surface is not enough. Tuna must be chilled through-and-through, and as rapidly as possible if they are to be landed without loss and are to yield a canned product of the best possible quality.

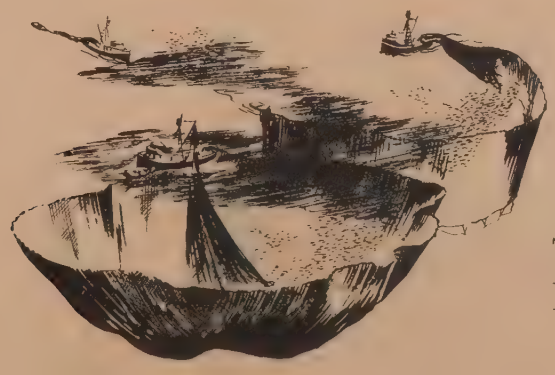
Thus tuna fishing calls upon the technology of refrigeration to an exceptional degree, on the fishing boats, and in the canning plants as well.

● Unlike many kinds of fish, tuna are chilled "round"; that is, without being dressed aboard the fishing vessel. Long experience has shown that quality can be protected best by this method. They are what fishermen call "warm-blooded fish," the body temperature actually being higher than that of the water in which they live.

The caught fish, whether they are taken by seines or live bait or longline methods, are immediately placed in cargo wells filled with sea water just at the freezing point. This extracts the heat from the fish rapidly, the icy sea water being circulated in the wells by means of powerful pumps, continuously chilling the fish, while temperature of the brine is kept from rising by frost coils over which it is pumped. This process continues until the fresh-caught fish have been frozen through-and-through, when the sea water is drawn from the wells and the fish are maintained in frozen condition by the coils lining the wells.

● At the tuna cannery the process is reversed.

Commonest practice is to place the fish as they are removed from the fishing vessel's hold in "thawing tanks," where fresh water is circulated until the fish are thawed sufficiently to permit butchering. They are drawn from the tanks by flume or conveyor and introduced into the canning process.



Three Steps In Purse Seining

How Tuna are Canned

● Tuna canning process divides into several distinct steps: 1, dressing, pre-cooking and cooling; 2, preparation; 3, can filling, salting, oiling and closing; 4, sterilizing, can washing and cooling; 5, warehousing, labelling and shipping. These will be discussed here briefly in numerical order.

1. Tuna enter the cannery on a moving slat conveyor, each fish on the same side, and headed the same way. As they move past the butchers the body of the fish is opened with a quick slash of a knife, the viscera and gills are removed, and the interior of the fish is washed with a hose.

At the end of the conveyor the fish are graded according to size and placed in shallow wire baskets for pre-cooking. These baskets are supported in metal racks of a height which will fill the pre-cooking retort. Only fish of uniform size are placed in the same rack, and each pre-cooker is filled with fish of this general size grading.

This segregation of the sizes is because of fish of different body thickness require special pre-cooking times. Filled racks carry an average of 750 lbs. of fish each. They are put in pre-cookers or low-pressure steel retorts or autoclaves, where steam is introduced under slight pressure to give a cooking temperature of 216°, occasionally as high as 220°.

Representative cooking times at 216° for tuna of the various sizes range from 5 to 10 hours for large fish on the order of 100 lbs. weight, and down to 2.5 hours for 10-pounders.

United States Per Capita Supply of Certain Fishery Items, 1936-1960

(Pounds of edible meat)

Year	Mackerel, Pacific and Jack	Salmon	Sardines[1] Pacific and Maine	Tuna[2]
	Canned	Canned	Canned	Canned
1936	0.43	3.07	1.26	0.45
1937	0.29	2.43	1.16	0.50
1938	[5]0.33	2.32	0.81	0.49
1939	[5]0.30	1.89	1.29	0.63
1940	[5]0.48	1.61	0.77	0.61
1946	[5]0.24	1.18	1.03	0.69
1947	[5]0.47	1.46	0.64	0.79
1948	[5]0.32	1.57	1.34	0.89
1949	0.26	1.70	1.00	0.90
1950	0.41	1.36	1.55	1.32
1951	0.26	1.44	0.40	1.05
1952	0.42	1.43	0.37	1.28
1953	0.14	1.25	0.60	1.38
1954	0.09	1.27	0.85	1.39
1955	0.15	0.99	0.39	1.42
1956	0.29	1.15	0.35	1.59
1957	0.25	1.01	0.45	1.59
1958	0.11	1.08	0.59	1.78
1959	0.14	0.95	0.61	1.89
1960[6]	0.18	0.74	0.47	2.05

[1] Includes imports of some herring for the years prior to 1950.
[2] Includes imports of bonito and yellowtail for the years prior to 1949. Data on exports were not available for these years.
[5] Exports not available.
[6] Preliminary.

Note: This table was compiled from available data on domestic production, imports, and exports. Estimated packers' canned inventories were used for tuna for all years, and for mackerel, salmon, and sardines for 1958-1960.

Source: U. S. Bureau of Commercial Fisheries.

Purpose of the pre-cook is (1) to expell the rat strongly flavored natural oil of the tuna; (2) to make possible quickly and fully to remove the skin and d meat of the tuna, and to separate the entire fish into f boneless loins of solid light meat. The skeleton struct of the tuna is simple and the bones large and strong.

Upon completion of the pre-cook the racks are wi drawn and the fish allowed to cool. While this proc sounds simple, in reality it makes a very large demand space, air circulation, time, and in some cases refrigerati Of the mistakes which have been made in designing t canneries, perhaps the most common is failure to all sufficient space and ventilation to cool the fish without l of time and quality. In some centers where conditions warm and humid, without good natural circulation of it is common practice to cool the fish in an insulated ro where refrigerated air is circulated through the cool racks by fans.

2. Preparation of the pre-cooked tuna is usually done women stationed at long tables with stainless steel work surfaces. The cooked fish may be delivered to the prepa tion crew in cooker baskets, or individual fish may delivered along the center of the table between facing ro of women by stainless steel belt conveyor. The heads a tails may or may not have been broken off before d tribution of the fish.

The women first scrape the cooked skin from the fi Such waste goes through openings in the table to a c veyor belt below for removal. After the fish has be scraped clean of skin it is carefully parted along the verti line of the backbone, and again along the lateral line. T gives four large pieces, along the inner surface of which the dark meat characteristic of *all* fish, but which in tu and other fish of the mackerel family is particula pronounced.

This dark meat is entirely wholesome, but its color not considered desirable in standard tuna—nor is its inc sion permitted under Food and Drug Standards without t label designation "dark" or "blended" tuna. This da meat is also very rich in natural oil, and thus is rat strong in flavor. It is widely used in the packing of cann food for cats, which consider it one of the greatest d cacies.

Freed of all skin, bones and dark meat, the four lo pieces of solid tuna—now known as "loins"—are put o conveyor, either individually or in groups on trays, a carried to the can-filling section on the production li

● *Can filling* processes in tuna canning are determined the character of the finished product ordered by the m keting division.

Chunk-style tuna rocketed into popularity a few ye ago, and in 1960 this type of pack accounted for 66.28 of all tuna packed in the United States.

When tuna of this style is being packed the loins pass conveyors under chopping knives of various types, design to cut the tuna into "bite-size" chunks of roughly co parable size.

These chunks then go into a "chunk-filler" machi which places a measured amount of chunks in the c Usually the cylinder of fish is pressed slightly smaller diameter than the can, in order to permit the salad which then is added to flow around the fish, between it a the tin.

Solid pack tuna is produced from whole loins which pass into an ingenious machine which presses and shapes them into a continuous cylinder. Then, as a can is presented in the machine, the advancing cylinder of fish is cut off at the right length to fill the can accurately. This is done by a lightning-quick stroke of a knife, which then moving sideways, places the measured portion of fish in the can just as the machine moves it away and presents another empty can.

Solid-pack tuna formerly was filled in the can by hand, and still is in a few instances or on special order. Where this is done the loins are passed through a "guillotine" knife, whose blade moves directly up and down. The conveyor moves a pre-determined distance between each stroke of the knife, which thus cuts the loins laterally into pieces the proper height to fill the size can being packed. These pieces are carefully fitted into the cans by hand.

Measured amounts of salt and oil, or salt, oil and "vegetable broth," are placed in the can, which then passes into the closing machines where vacuum is established in the can and it is sealed hermetically.

● As the filled and closed cans emerge from the seamers they are placed in huge metal baskets preliminary to the process cook in horizontal sealed retorts where the product is sterilized by steam under pressure at a temperature of either 240° or 250°.

Approximate processing time for the various more common sizes of tuna cans, presupposing an initial temperature of 70°, are:

Can Name	Time in Minutes at 240° F	250° F
¼ Tuna	65	40
½ Tuna	75	55
No. 1 Tuna	95	80
4-lb. Tuna	230	190

Upon conclusion of the processing cook the cans are passed through a mechanical washer where they are thoroughly scrubbed in a hot detergent solution to remove any grease or bits of fish from the containers. The cans in baskets then go to a warehouse area where they are cooled in air and prepared for warehousing.

● *Grated and Flake* tuna are minor styles of pack which are widely used for making tuna sandwiches, where size of the individual bit of fish is not a consideration.

This pack is made from pieces of fish too small or too irregular in shape to be acceptable in the Chunk-style pack. In the case of grated tuna they are reduced mechanically to approximately equal fineness.

The Oil in Canned Tuna

● All tuna canned in the United States has oil added to the can immediately before closing. In some instances in addition to the oil a small amount of vegetable broth is also introduced to meet individual consumer preference for flavoring.

Examination of the label on the can will plainly indicate the style of the pack which it contains.

The oil used, whether alone or with the vegetable broth, is one of the high-grade polyunsaturated vegetable oils, usually soya oil, but on occasion either corn oil or cottonseed oil. In any case, it is one of the vegetable oils recommended as protective against cholesterol formation in the blood stream.

Function of the oil is two-fold: (1) to replace the natural, rather strongly flavored oil removed from the tuna during the precook, and thus to avoid undue dryness in the canned product; (2) to lubricate and insulate the surface of the fish in contact with the can during the sterilizing process cook, thus avoiding development of over-cooked or "scorched" flavor resulting from direct contact of the dry tuna with the hot metal of the can.

The "vegetable broth" whose addition to tuna is provided for in the Food and Drug Administration standards is made by boiling flavorful vegetables to give a pleasant, though very mild flavoring to the fish cooked in the broth-and-oil combination. It serves to reduce the amount of oil necessary to protect the quality of the canned tuna, and for this reason the oil-and-broth pack is favored by some persons.

Many consumers prefer to use the oil on a can of tuna in preparing the fish for the table. Others discard the oil. In either case the user may be sure the oil is pure and wholesome, and of the polyunsaturated type; and that the tuna canned in it is more to the taste of the American market than it could be without the oil.

● This is not to say that there is no tuna without oil on the American market. Very large quantities of "Tuna in water," as the Food and Drug standards require to tbe stated on the label, are imported from Japan. Such tuna is widely distributed in the United States, where it finds a market on the basis (1) of its lower price; (2) among persons seeking to eliminate as much oil as possible from their diet.

The salt added to canned tuna for seasoning is put in the cans by automatic machines, which deliver a carefully measured amount, usually 3/32 oz. in the case of ¼-lb. cans; 3/16 oz. for halves; and 5/16 oz. for the 1-lb. tin.

Canned Tuna Standards

● Canned tuna at time of publication of this third edition of PACIFIC FISHERMAN'S *Canned Fish Hand-i-Book* was the only canned sea food with full official U.S. Food and Drug Administration standards of identity and fill of container. Thus the interests of the consumer are specially protected by the authority of this exacting agency of the United States government.

Some other sea foods have standards for certain aspects of the commodity, its packing or labelling, but only in the case of tuna are these standards all-inclusive.

The official standards are too detailed and technical to warrant reproduction here in full, being devoted in large part to instructions as to technical tests to determine compliance with the standards.

Standard provisions of general interest to canned tuna consumers and distributors include:

What is tuna?

To be labelled *tuna* in the United States the product must be canned from fish of the following varieties, the scientific names of which in italics follow the common or trade names:

Bluefin tuna, *Thunnus thynnus*
Southern Bluefin tuna, *Thunnus maccoyii*
Northern Bluefin Tuna, *Neothunnus rarus*
Albacore, *Thunnus germo*
Big-Eyed tuna, *Parathunnus mebachi*
Oriental tuna, *Thunnus orientalis*
Yellowfin tuna, *Neothunnus macropterus*
Skipjack, *Katsuwonus pelamis*
Little Tunny, *Euthynnus alletteratus* or *Euthynnus lineatus*
Kawakana tuna, *Euthynnus yaito*

Styles of Pack in Tuna

Solid pack consists of solid segments of loin, packed on end in one layer—save in the case of cans above 1-lb. contents—and with no small free fragments added, except that one small piece may be added to make full weight. Free flakes broken from the loins in canning may not exceed 18%.

Chunk style consists of pieces of tuna retaining the original muscular structure, and with at least 50% of them pieces exceeding ½-inch dimension.

Flake tuna similarly must retain original muscular structure in all pieces, but more than 50% of them may be smaller than ½ inch.

Grated tuna has been reduced to uniform size which will pass through a half-inch mesh screen. However, the particles must be discrete and not reduced to a paste.

Smoked tuna any of the above styles may be smoked, but must be so labelled.

Color standards of tuna are established on a scientific determination basis which requires labelling of Munsell color unit values as *white, light, dark or blended.*

● The standards provide that canned tuna may be packed in any edible vegetable oil, or blend of such oils, olive oil, or water. It may be seasoned with salt, monosodium glutamate, hydrolyzed protein, spices, garlic, or vegetable broth.

Amount of vegetable broth shall not exceed 5% of the capacity of the container. It shall consist of not less than 5% of vegetable extractives, and must be prepared from a blend of vegetables.

The packing medium must be stated on the label; for example: "In vegetable oil," "In olive oil," "In water." Seasoning must also be stated, as "Smoked," "Seasoned with vegetable broth," "Spiced," etc., as the case may be.

● The canned tuna standards specify the required fill for each of the generally employed sizes of tuna cans, and establish the technical process by which this must be determined. The required fill is based on the average drained, pressed weight of the solid contents of 24 cans.

National Tuna Specialties

● Canned tuna as a major food commodity is packed after the manner previously described: dressed; pre-cooked; prepared by removal of skin, dark meat and bones; packed in the can with the addition of salt, vegetable oil, water and in some cases natural flavorings.

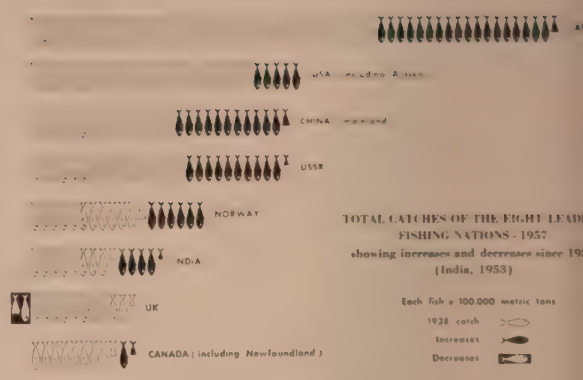
National styles of canned tuna have developed in a number of nations throughout the world where tuna is caught and have become an element of traditional diet. In a few instances these specialized styles have gained standing in other markets, and one at least—"tonno"—has achieved some importance as to volume.

Some of these national tuna specialties include:

Tonno, originating along the Mediterranean, has become popular in some markets in the United States, notably where there is a considerable population of Italian ancestry. It consists of one of the darker and more distinctly flavored tunas, usually Skipjack or Bluefin, packed in olive oil, and often with somewhat more salt than standard canned tuna.

Jellied tuna appears to have originated as an article of commerce in the eastern Mediterranean; and also is packed to some extent in Japan for export to Europe.

"Tenderized" tuna is a proprietary family of canned tuna foods popular in Japan, where tenderized tuna is packed in



several sauces, based variously on soya sauce, curry, toma and other condiments. In addition to its popularity Japan, the product is reported to be finding favor in oth countries in Asia and Europe.

Kippered tuna and other methods of smoking applied tuna which is then canned have been developed in a nu ber of countries, and have shown some tendency to devel popularity in the United States, although the volume pack there still is very small.

Antipasto is perhaps the oldest form of canned tu specialty, an appetizer of Italian origin. This is a fan hors d'oeuvres-type delicacy, usually packed in glass, which tuna and a number of vegetables are colorfully a ranged and packed in olive oil.

What the Label Tells

● Label requirements for canned fish and sea foods va somewhat after meeting the basic points, three in numbe (1) statement of the legal name of the product; (2) a curate statement of the quantity of the contents; (name and address of the packer or distributor. To the should be added, in the case of imported canned fish, t name of the country of origin.

These requirements are basic. All canned fish and s foods bear them.

Tuna and oysters stand apart from other canned s food in that full standards of identity and fill of contain have been provided for them. Thus their labels bear son additional data beyond the basic requirements.

A few other sea food products are required to sta their contents in drained weight rather than net weight.

Labels must state added ingredients, such as salt, oli oil, tomato sauce; and any artificial color.

● In addition to the *requirements,* many packers ma their labels *informative* by including recipes, an estima number of servings, a picture of the product, size individual units (as in the case of oysters) and oth data.

Suggestions are sometimes heard that the national go ernment should require "grade labelling," which would se to rate the quality of the contents. The sea food canni industry generally feels that *descriptive* labelling alo the lines of its current practice provides the consumer wi more information than would be possible under a syste which sought to apply "good, better and best" rankin to such qualities as flavor, where individual preferen varies widely.

Canners generally feel that it is better to state physic characteristics which can be objectively, specifically a scientifically measured, and then let her make her ov selection.

TUNA TODAY—A romance

In international industry

Development of the tuna industry is one of the industrial mances of the past three-score years.

Known from antiquity, tuna has become the most val- ble of the world's canned fish in the course of two nerations.

Moreover, man has not yet begun to utilize the resource its full extent, even as that extent is known today; and w populations, new fisheries, new resources are consis- ntly being disclosed to those who explore below the sur- ce of the sea.

Men have used the tuna of the Mediterranean since the wn of civilization, but the utilization of the resource for e broad benefit of Man had to wait until canning was scovered—and almost a century more; for tuna proved difficult to can as it was to catch.

But in Southern California men descended from the omans, the Greeks, the Dalmatians and the Iberians of e Roman Empire found tuna in the seas of their new omeland, Southern California.

There early in the Twentieth Century they learned how can tuna successfully, and how to catch it in the volumes nneries required. There and then was born an industry hich has grown into the world's front ranking seafood nning business.

When California's Albacore failed for a time in the id-Twenties the Japanese were prepared to meet the need ith frozen Albacore for canning in United States can- eries. There international trading in tuna began.

The Norwegians caught big Bluefin and sold them to the Italians to supplement the yield of the Mediterranean. France and Spain and Portugal entered the field.

By this time Japan had become the leading tuna fishing nation in the world, although the United States continued far ahead in canning.

Rich areas of tuna abundance were found off the west coast of South America, and Californians fished all the way from their state to the latitude of northern Chile, far at sea, far from home.

In Peru there rose a fishery for tuna and its related bonito, and finally for anchovies, which today has become one of the great producers in the world.

Then the tuna riches of Australia were revealed, and canning began there.

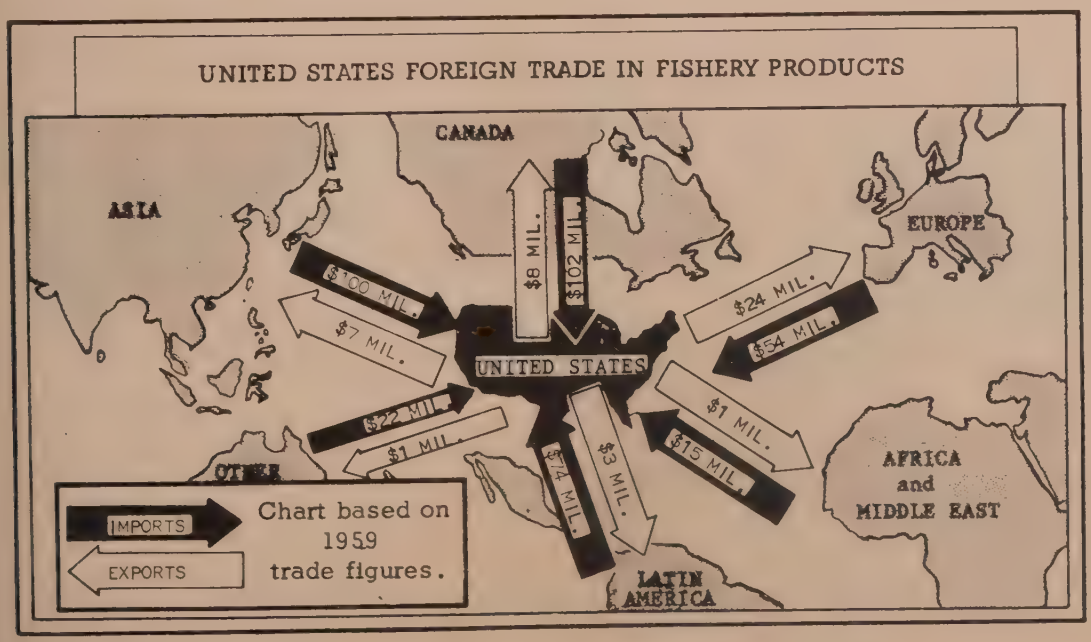
Finally the far-ranging Japanese found tuna in abundance in the Atlantic—in a broad belt along the Equator all across the ocean to Brazil; off the great western bulge of Africa; off the southwest coast.

Man does not yet know the extent of the tuna resources.

● One of the giants among nations prepares as this is written to enter the field.

The Soviet Union, ranking with the first four fishing nations of the world, admittedly looks to tuna for further growth and prepares a fleet with which to fish wherever the fishing is.

Thus tuna grows, as a resource, as a food, an industry, a romance.



SALMON, the Leaper

• Salmon, the Leaper, as the Romans named him, ranks next to tuna among the world's canned fish and seafoods. He is a fish of the cold northern seas, rarely taken in any volume south of the latitude of Oregon, Nova Scotia, northern Japan, and France.

Salmon are limited in range by ocean temperature, and there are today only four countries which make any significant contribution to the world's supply of canned salmon —the United States, Canada, Japan and Soviet Russia.

Commercial salmon canning, and indeed the species on which salmon canning wholly depends, exists only in the North Pacific.

It is true that there is an Atlantic salmon, and that it is caught in northern Europe and eastern Canada, but this species is not available in sufficient volume to support a canning industry; nor is it well suited to canning, although greatly esteemed fresh, frozen or cured.

• Salmon used for canning, then, are strictly the Pacific salmon, the *north* Pacific salmon.

Nature restricts the range of the salmon principally by water temperature, in the sea and in the streams, for salmon spent part of their lives in each of these habitats; and each must suit within a range of a few degrees.

The water of the streams must be *cold;* and it must be *clean;* and it must *flow* and be well aerated.

To suit salmon the sea must be cold, and of relatively low salt content. Thus salmon are happiest in those portions of the sea where rain and snow falls abundantly, and where enormous glaciers and ice caps, melting, reduce the salinity of the ocean's surface layers.

Scientists find invisible temperature barriers in the sea, usually having their southern limit near 45° Latitude, half-way between the Equator and the North Pole; and with its northern limit about the middle of Bering Sea. Pacific salmon live in the sea between these limits, save f points near the coast of California, China and Japan, whe cold coastal waters permit them to range further sou along the continental masses.

By these natural boundaries and their fresh water requir ments Pacific salmon are produced only by the Unit States, Canada, Soviet Russia, Japan, and Japanese flo ing operations on the high seas.

With no possibility of finding new resources of salmo and with the encroachment of civilization and its use a abuse of fresh water resources pressing heavily upon t productivity of salmon in the vital fresh water phases its environment, maintenance and re-building of the Nor Pacific salmon resources plainly demands cooperation conservation on an international scale.

Given this, and assuming the honest devotion of natio to the principle of conservation which calls for maximu sustained yield and adequate seeding of the spawni streams, the North Pacific salmon resource can be perpet ated as one of Earth's great natural food resources.

Lacking such international devotion to the princip of sound conservation, this invaluable resource may co tinue to decline, as it has unquestionably declined in t past two decades.

Salmon have a seasonal limitation which profound effects salmon canning, the principal means by which m use the resource.

Thus, salmon in general are not available to fisherm and their gear throughout the year, but only from ea May through November, the period in which the salmo reaching the fullness of their maturity, move into coast waters where they can be taken at their prime of si and quality, and under conditions contributing signi cantly to the conservation of the species and the perpet ation of the resource.

Chinook Salmon—

"King" is a name often given to this species, the largest of the salmon, but a relatively small factor in the canne salmon pack. The name "Chinook" is usually reserved for the finest of the species, which averages about 24 lb weight when canned. Specimens have exceeded 100 lbs. This is the most widely distributed salmon of all, bein taken in North American from Monterey, Calif., north and west to the Yukon River.

Salmon limitations as to geography, physical requirements and seasonal occurrence impose specialized problems, costs and hazards upon the industry which catches and cans fish for Man's use.

These are inherent in the industry and in the character of the resource it utilizes and makes available as a seafood delicacy. Thus:

Salmon canning must be conducted in high latitudes under the restrictions and rigors imposed by sub-arctic conditions, such as those prevailing on Bristol Bay and Cook Inlet, where ice on the sea is an early-season hazard.

Again, the character of the streams and lakes required for salmon propagation is that which goes along with remoteness and high transportation costs.

Finally, the seasonal character of salmon availability, which often is limited locally to a few weeks a year, results in high charges where a cannery built and maintained at great cost in a remote sub-arctic area must be amortized in only a few weeks per year. The plant and the investment it represents in most cases must stand idle through the large majority of the year at a further direct cost for watchmen and maintenance.

● Another problem, common to all fisheries in some degree, and particularly important in the case of salmon, is the unpredictable character of the supply. For generations effective forecast of salmon abundance has defeated and confounded the prophets. Only in recent years, and in a few limited areas, has it been possible for predictions to be made with any assurance of accuracy. These have been based on scientific research and painstaking application of its findings to the probabilities of the future.

Such research seems essential for forecast, and it is being undertaken with a continually broadening and ambitious program, by states, nations and international agencies.

In successful forecast which scientific studies may make possible, lies a most promising means of reducing the cost of canning salmon through tailoring preparations to the supply of salmon in prospect; and also of determining the scientific and administrative measures which will contribute most to the stabilization of production at the highest level of yield which can be sustained from year to year; in short, to conservation.

The Salmon Story—

A Romance of Rivers and Sea

● The Pacific salmons number six species, one of which is found only on the Asian coast, and even there is a factor of minor importance. Thus for all practical purposes there are five Pacific salmon.

Physical differences between these species are discussed hereafter. With a few exceptions, their life histories are virtually identical, and all follow a remarkable and romantic pattern.

Here, then, is a synopsis of the "plot" of this romance of life, and death, and new life emerging—a biological novel of classic character.

● Where does life begin?

It is an old question to which there is no clear-cut answer. For the purpose of our synopsis, let us start with the arrival of the parent salmon on the spawning grounds. To reach them they have left the sea and ascended the swift river, sometimes surmounting incredible obstacles; but now they are in quieter waters, strongly flowing to be sure, but where the stream is wide and rather shallow over a gravel bottom.

The salmon take their mates, apparently on the basis of availability rather than individual selection. Once he has chosen a mate, the male will seek to drive other suitors away; but if he strays too far, or is not aggressive in defense of his prior rights, he may find himself displaced.

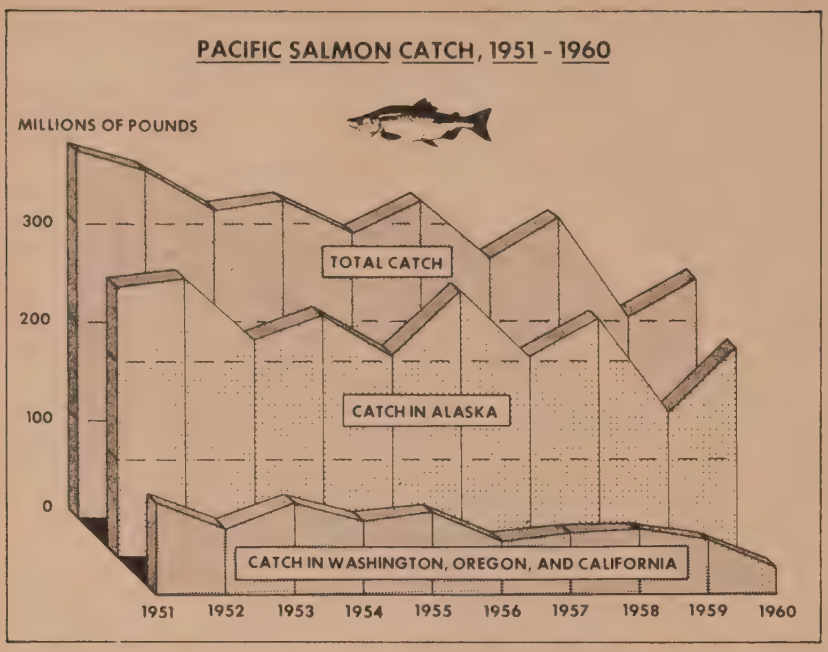
The female is less concerned with the identity of her mate than she is with preparing her nest, or "redd," as it is known in the vocabulary of fisheries biology. This she does by vigorous digging in the gravel, turning on her side and sweeping strongly at the gravel with her tail. As she stirs the gravel the current helps, and eventually the redd is ready. It will be roughly oval, three to four feet long and perhaps half as wide; a foot or more in depth.

All this has taken time, and has been accompanied by changes in the pair of fish. The fighting of the male and the digging of the female have scarred and bruised their bodies, worn and split their fins. At the same time, the colors of their spawning dress, which began to become apparent as they left salt water, have become more pronounced. Even their body shapes have undergone change. This is true particularly of the male, and most notably in the Pink species.

Finally, in the fullness of their maturity, with the nest complete and the rivals driven away to find mates elsewhere, the pair move close together, side-by-side, the female slightly ahead. She lowers herself into the nest and sheds a stream of bright orange-pink eggs. At the same instant the male discharges a cloud of white sperm which, dispersing promptly in the water, fertilizes the eggs. They are heavy, and sink quickly into the openings in the loosened gravel.

The female moves to the upstream edge of the nest and resumes vigorous digging to enlarge it, and to displace gravel which is carried downstream by the current, effectively covering the fertilized eggs and protecting them from predators.

The process is repeated several times a day for perhaps



Fishing Seasons for salmon vary between the principal salmon canning areas. Canning begins in May in Oregon and Washington and a few small areas in Alaska. In the Pacific Northwest states canning continues until mid-November; but in Alaska the principal seasons are short and intense. The great Alaska fisheries start producing late in June, and most of the fishing is over by the end of August; usually followed by a short fall season about a month later. Generally speaking, Red salmon run early, followed by Pinks, and with the Chums and Silvers appearing latest.

four days. Finally the fish are "spent," their spawning products shed. They maintain their positions near their redd for a time, but gradually their waning strength, the inexorable processes of physical change associated with the spawning of their genus, the approaching end of their time, leave them unable to hold their place. They drift downstream and die—*always*.

No Pacific salmon has ever been known to live more than a few days beyond its spawning. In this is the fundamental difference between the Pacific salmon—all six species—and the Atlantic salmon.

● The salmon eggs were deposited in the fall. During the winter months the tiny young develop within the eggs deep in the gravel. If the water where the salmon spawned was too shallow the winter freeze-up may lower the stream to where the gravel is exposd. Then the eggs will dry in the bitter cold of winter and will die. Or if they have been disturbed by the digging of late spawners, or if too many eggs are crowded together, some may die, become fungused, and infect the remainder. Such are the hazards of the embryo.

By early spring natural processes will have produced tiny fish in the surviving eggs. The outer membrane of the egg splits and the "elver" emerges, with the egg sac still attached to its body. On this the little fish subsists for many days, until it is big enough and strong enough to swim freely and capture food.

Here the life stories of the several species may diverge. The young or "fry" of two varieties go to salt water immediately; others remain in the stream for months, growing. One of them, the Sockeye, is reared in a lake—and there is *always* a lake available on the stream where Sockeye spawn, for a lake is essential to the fulfillment of the Sockeye's role in the drama.

● After the manner and according to the timing of their particular natures, the young salmon go to sea. They are now "smolts" or downstream migrants. The physical change from fresh water to salt must be profound indeed, and once it has been made the young salmon grows strongly.

They range far to sea, some of them thousands of mil from the streams of their birth. In the areas of intermi gling in mid-ocean salmon of North American origin m associate with those of Asian origin in areas and propo tions whose precise pattern Man does not yet fully unde stand.

Here they are first subject to fishery in the high se operations pursued only by the Japanese. Fish taken this period are not fully mature. Many of them are least a year short of maturity. It is not yet possible distinguish between them precisely as to their continent origin, much less as to the river system from which th came—to which they must return.

Thus it is not possible on the high seas to confine t fishery to salmon at the time of their largest size and f maturity; or to those of specific national or continent origin; or to those from stream systems whose populatio are in good condition, while protecting the races whi are weak.

It is for these reasons that the United States, Cana and the Soviet Union restrict their fishermen to coast waters. There the salmon are fully mature, are taken in t territorial waters of their native coasts, and may be ha vested or protected as sound conservation dictates.

Sea life of the salmon varies in length by species. T Pinks return to their native streams only two years aft their parents have left the sea. Kings may live six yea in the sea. Other species range from three to five or s years of age.

Whatever the fullness of their time may be, at the pe of their size, quality and maturity they start back to t stream systems which gave them birth. How they find t way in the sea, into the river mouth, into the very tributa where they were spawned, no man knows. There a theories, but no agreement.

It is during this migration that most salmon are tak by fishermen. In his prudence Man seeks to permit t passage through the fishery and to the freedom of t streams salmon in sufficient numbers adequately to se the gravels of those streams, and thus to perpetuate t species.

How many salmon should be allowed to escape? what percentage of the entire run should be permitted

pawn? How should the escapement vary between streams? And should it be the same for each stream from year to ear?

These appear to be simple questions, but the correct nswers have been perplexing, and escaping, scientists for nany years. It is but recently that researches in some mited areas have begun to point plainly to certain conclu-ions. The future promises wiser administrative practices, ased on sounder science.

• The salmon which have passed above the fishery press trongly up the stream. They have ceased to feed and ubsist altogether upon the reserves of fat and protein hey have built up in their bodies in the last few weeks of heir sea life. The journey may be long, as much as 700 niles, and sometimes more. The stream they stem is certain o be swift, and the way beset by hardships and dangers. Great dams may bar the way, and the salmon must seek nd ascend fish ladders to the quieter waters above. There n the warm waters of an artificial lake they may find dverse temperature conditions. Fish delayed too long at lams, seeking a way to surmount them, may mature so apidly that they die before finding suitable spawning ravel.

Eventually the strongest reach the upper reaches of the tream—almost always the same stream where they were natched.

The process by which the "homing instinct" brings them back from the enormous reaches of the sea to the same iver, the same creek, the same small tributary where heir lives began is one of Nature's secrets, for which the visest scientists have found no wholly satisfactory explan-ation.

Here where our sketch of the salmon's life history began, hey court and fight, dig their redds, spawn, and die.

• Dams we have spoken of as hazards encountered by salmon working upstream to their spawning grounds. They are also perils for the fingerlings moving downstream on their migration to sea. These little fish are killed in turbines or, sweeping down spillways are so injured in the areas of great turbulence that they fall easy prey to predators—other fish, birds and all manner of fish-eaters.

The small fish may be diverted into irrigation systems or suffocated as they pass through streams polluted by sewage and industrial wastes.

• For three-quarters of a century men have sought to improve upon Nature in the propagation of salmon by means of hatcheries and rearing facilities. Results have been variable and somewhat inconclusive. Under certain conditions they appear to have been attended by some success. On the whole, scientific analysts of the results are inclined to question whether either biological or economic benefit can be demonstrated for artificial propagation.

Of recent years the most progressive thinking with respect to artificial propagation of salmon is that it should seek to *aid* Nature rather than to substitute for natural processes; that the processes should simulate those of Nature as closely as possible (for example that the eggs should be kept in total darkness until hatched); and that the fry should be introduced into their natural rearing environment as soon as they are able to swim freely, and without any artificial feeding. The theory is that the strongest and fittest will survive and seek their own food in the unrelenting competition of nature.

Another promising method of maintaining salmon resources in the face of advancing civilization provides artificial spawning where natural stream beds are too steep or too unstable to be satisfactorily productive. Here Man seeks only to provide better spawning beds than occur in nature, and then lets Nature guide the life which results.

The 5 Pacific Salmon—

How and where men catch them

• Salmon are caught for canning by two basic methods—gillnetting and seining.

Gillnetting employs a web—today almost always of nylon— which is suspended in the water, where it usually floats with the current. This form of net, which captures the fish by *entanglement*, depends for its effectiveness on the fish striking the web unawares. Thus, it fishes best in muddy water, or at night. The fast-swimming fish thrusts its head and the forward portion of the body into the net of strong, fine twine, whose meshes are of a size designed to prevent salmon of average size from passing through. Held tightly in the grip of the elastic, tenacious nylon, the salmon is powerless to escape.

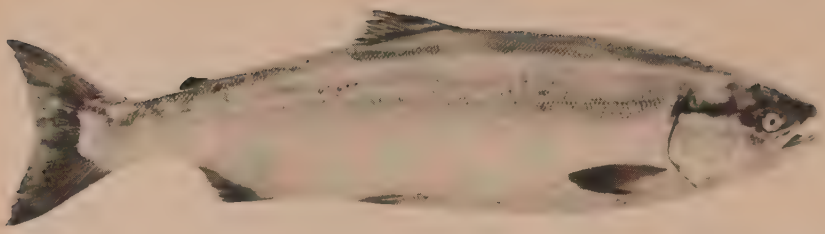
Setnets are stationary gillnets secured to the shore at one end, and to an anchor at the other. Their method of fishing is identical with that of the conventional floating gillnet; but they are associated with one location, do not fish freely.

• *Purse seines* are long, deep nets of synthetic fibers or cotton which are set from a fishing boat around a school of salmon which has been detected close to the surface. The bottom of the net is closed by a power winch hauling in on a line which runs through rings along the lower edge of the seine, thus "pursing" the net and giving the method its name. This is fishing by *encirclement*.

In some variations of this method the seine is fished from the beach or shore, reaching from the surface to the bottom, and thus preventing escape of the catch without the pursing operation.

• There are four other methods employed in commercial fishing—*trolling, trapping, reef-nets* and *fish wheels*. None of them are of wide importance in high seas or North American fishing.

Trolling catches salmon on a hook as the fish strikes a lure drawn slowly through the water at sea close to the coast. It is of some importance as a measure of catching



Red Salmon—

Called "Sockeye" in some areas, this fish is the most important factor in salmon canning the world over. Weight averages about 6 lbs. The flesh is a true "salmon red" color, firm, and of fine flavor.

salmon for the fresh, frozen and cured markets, but salmon taken by this method are rarely canned—due in large part to the high cost of this type of fishing.

Trapping is a method which has been ruled illegal in most areas. It is permitted in one small fishery in British Columbia and at a few placse in United States Indian reservations where treaties permit the Indians to fish by methods not elsewhere legal. Contribution of salmon traps to the canned salmon supply today is minor, although a few years ago it was a major factor. Principal attack on the salmon trap, which led to its limitation, was: *the method requires and confers a special right of fishery at a preferred location.*

Reefnetting is another minor form of salmon fishing, believed to be limited to Puget Sound. It is a modern development of a primitive Indian method of fishing which sets a net for the salmon as they rise to surmount a reef, natural or artificial.

Fishwheels, which are turned by the current, scoop up the salmon as they migrate up the Yukon River, believed to be the only fishery where this form of gear is still employed.

Where salmon are caught—

● In the United States, Canada and Soviet Asia salmon are caught in territorial waters as they approach the coast or enter the inlets on their spawning migrations.

Japanese fishermen, lacking any substantial salmon runs to the streams of their national islands, fish salmon on the high seas of the North Pacific in a broad band running north and east from the islands of Japan and from Kamchatka along the curve of the Aleutian Island as far as 175° West Longitude, which falls at the westerly end of Atka island.

Under the International North Pacific Fisheries Convention which became effective in 1953, the Japanese have abstained from fishing east of that line, where the treaty accepts the salmon stocks as already fully exploited and protected by American and Canadian fishermen and governments.

Trend of World Fish Catches (In Millions of Metric Tons)

Continent	1938	1948	1954	1955	1956	1957	1958
Africa	0.52	0.83	1.64	1.69	1.80	1.91	1.93
America, N.	3.15	3.62	3.91	3.89	4.29	3.95	3.90
America, S.	0.24	0.45	0.66	0.80	0.86	1.11	1.38
Asia	9.36	6.49	10.79	11.59	12.02	13.30	*16.27
Europe	5.59	6.12	7.51	7.62	8.08	7.66	7.49
Oceania	0.09	0.09	0.11	0.11	0.12	0.13	0.13
U.S.R.R.	1.55	1.49	2.26	2.50	2.62	2.54	2.62
World Total	20.50	19.09	26.88	28.20	29.74	30.60	*33.72

*Includes the production of China (Mainland) estimated by various sources at 6 million metric tons.

—Source: FAO Yearbook of Fishery Statistics.

Questions raised by high seas fishing of stocks of salmo (1) originating in or along the territory of nations whic protect them, (2) study them scientifically, (3) have existing and historic fishery, and (4) already are using t resource to the full extent to which the yield may sustained from year to year, are among those which perple the fishermen and statesmen of the nations concerned wi the peace and resources of the North Pacific Basin.

● Five species of salmon are significant in salmon cannin These species, their characteristics, and some of t interesting specific facts about them are:

Red or *Sockeye* (*Oncorhynchus nerka*) is a stand-by salmon canning. Its flesh is the clear orange-red col which confers the name "salmon" to this particular shad The average fish of this species is not large, generally bei in the neighborhood of six pounds.

Principal Alaskan sources of the canned Red salmo pack are Bristol Bay, Kodiak Island, Cook Inlet and Co per River districts, where the species is generally called t Red salmon, although sometimes Sockeye on the Copp River.

In British Columbia the species is called Sockeye a comes principally from the Skeena, Naas and Fras Rivers, particularly the latter.

Washington state shares Fraser River Sockeye fishery Puget Sound, while the Columbia and Quinault Rive produce minor quantities, often called Bluebacks.

On the western side of the Pacific Red salmon are fou principally returning to the rivers of Kamchatka.

Japanese high seas operations exploit a mingled stock Reds in mid-ocean just west of the line at 175° West Lon tude, and then follow the Asian element of the populati westward as it moved toward Kamchatka. Necessaril this mid-ocean fishery falls alike on fish nearing maturit which would spawn in that same year; and unhappily al on the immature age classes which naturally would ha more than a year of growth before them.

The Red salmon is a trim, blue-and-silver beauty, fir of flesh, rich in oil, high in color of the canned flesh. its migration route takes it into fresh water streams chang comes quickly, particularly in the male. The color of t body becomes bright red, with the head and tail dark gree The snout elongates and becomes hooked, the ba develops a low hump. In the female these changes are le pronounced.

● *Pink Salmon* (*Oncorhynchus gorbusha*) is the smalle of the salmon, and likewise the most numerous. Its weig averages 4.5 pounds. The fresh-run fish is distinguished appearance by its small scales and the large round or ov spots on the tail. The flesh is a mid-pink when fresh, a pale pink in the can. Oil is less than that of other specie save the Chum, for these fish run into short stream spawn close to the sea, and do not need large reserves fat for long migrations.

Flavor of the Pink salmon compares with any specie

Pink Salmon—

This is the smallest and probably the most numerous of the Pacific salmons. Its canned flesh is light in color and relatively low in oil, factors which react against it in market price. Nutritionally and in flavor it ranks with any variety. It is especially useful in the preparation of cooked entrees.

although not so definite as the Red. Protein value is comparable, but the caloric count is less.

There are two particularly notable features of the Pink salmon's life history. At the time of spawning the male develops a high hump on its back, much more pronounced than the Sockeye. This fact is responsible for one of the names which the fisherman gives the species—Humpie.

In the second respect the Pink salmon is unique. Its life history covers a span of only two years, never more. There is no known instance of Pink salmon living beyond their second year.

This species also has the peculiarity in a few areas of appearing only every other year. Thus on Puget Sound the Pinks run significantly in the odd-numbered years. On the even-numbered years there are only a handful of Pinks. What produced the astonishing cyclic condition is not understood. Men have tried repeatedly to transplant Pink salmon from other areas to Puget Sound in even-numbered years, but to no avail.

● *Chum Salmon* (*Oncorhynchus keta*) is the third most important species in the canned salmon pack. This fish, which is the lowest-priced of any of the salmon, has flesh which is light in color, and which in the can ranges from pink almost to white. The oil is not abundant, but like the Pink the protein value is virtually as high as any.

The Chum salmon, again like the Pink, usually spawns close to the sea and has little fat. Strangely, this species is the greatest ocean wanderer of all. Chums tagged in mid-Pacific have returned to the fisheries of both Asia and North America, and in roughly equal numbers.

Chums average about 10 pounds in weight and usually mature at the end of their third year.

In southern waters, such as Puget Sound, the Chums run rather late in the fall, but in western Alaska the principal runs come in mid-summer.

● *Silver Salmon* (*Oncorhynchus kisutch*) are often known in the salmon trade as *Coho* or *Medium Red.* The latter term, which refers to their color canned, only slightly less intense than that of Red salmon, is falling into disuse because of the unfavorable connotation with the more highly prized Red.

While Silvers are important factors in the canned salmon pack, they are specially esteemed as fresh and frozen salmon. Thus the canners often find vigorous buying competition from those serving the more volatile markets. Silvers usually run a little smaller than Chums, from 8 to 10 pounds, although occasionally they reach 20 pounds.

Central Alaska, being relatively isolated from the demands of the cold storages, makes the principal contribution to the pack of canned Silver salmon.

Silvers share with their larger relatives, the Kings or Chinooks, the esteem of sportsmen. Of the five Pacific salmon, these two are the species which by their nature strike a lure and take a hook and, by the same token, provide some of the angler's most breathless moments. Where the Chinook is a deep and dogged fighter, the Silver is a leaper, a steeple-chasing fish.

To the demands on these species above those of the other salmon are added those of the sportsmen, thus intensifying the problem of protection and conservation.

● *Chinook, the King salmon* (*Oncorhynchus tschawytscha*) is the greatest of the five in size and strength, but fewest in number. This is the salmon which the North Coast Indians call *Tyee,* The Chief.

White men came to call the Tyee "King," and "Chinook," after the confederation of Indian nations clustered about the Columbia River where this species reached greatest abundance and peak of quality. In British Columbia the special name *Spring* finds favor, along with *Tyee,* the latter name there being the favorite of the sportsman.

Silver Salmon—

"Coho" is a common trade name for this splendid salmon, which is intermediate between the Red and Chinook species. Averaging about 9 lbs. when used for canning, the flesh is a deep salmon pink. This species is widely used for freezing, and is especially beloved of the sportsmen.

In the canned salmon trade it is general for the term *Chinook* to be applied to the higher quality fish of this species, notably those originating on the Columbia, Copper and Yukon Rivers and Cook Inlet. Elsewhere in United States territory the designation is more commonly *King*, and in Canada the generally favored designation is *Spring*.

Chinook is the largest of all salmon, averaging about 24 pounds throughout its great range from Monterey, Calif., to the Yukon River. Individuals up to 80 pounds are not uncommon on the Columbia River, and in Alaska specimens above 100 pounds have been officially recorded.

Principal method of fishing for Chinooks and Kings is by means of gillnets or trolling. Fish for canning are taken almost entirely by means of gillnets, with a few caught incidentally in seines. Troll-caught Kings are not available for canning, as the fresh, frozen, and particularly the smoked, salmon trade pays a premium for this fish.

Besides its great range geographically, this species has wide range in quality. Best Chinooks command the highest prices of any canned salmon; but in some areas, and even at certain season in the same areas which produce the highest quality, the value of this species falls to lowest levels.

Chinooks of good quality are the fattest of the true salmon, and are often reserved for those markets which put a premium on richness in canned fish. Further to meet the requirements of such markets, some packers of this variety add salmon oil to the cans. This is always indicated on the label, and the oil used is of the highest quality, made from edible portions of the salmon which are considered too bony or otherwise unsuited for inclusion in a fancy pack, for which fish of this character are always reserved.

● *Steelhead*, often considered a salmon, at least when canned, actually is a giant sea-going Rainbow trout, as big as many salmon, but more closely related biologically to the Atlantic salmon than it is to the Pacific species.

Like the Atlantic salmon, the Steelhead is a member of *Salmo* genus, which the Pacific salmon belong to Genus *Oncorhynchus*.

A few thousand cases of Steelhead are canned annually, almost exclusively for the markets particularly favoring fat fish, for the Steelhead is the richest of all, including the Chinook. The flesh of the Steelhead, however, fades in color in the canning process, reacting somewhat against its value.

Atlantic salmon (*Salmo salar*) is canned to a very limited extent in Europe, but the fading of its color to pale pink reacts against its popularity, while the price is extremely high because of the competition of the fresh and smoked salmon markets.

Masou salmon is a sixth species of the Pacific salmon, normally found only along the Asian coast. It closely resembles the Chum in outward appearance, but is generally considered superior, falling between the Silver and Chum in quality grading. The quantity available is not large, and if the fish is canned at all it is for the domestic trade in Japan or Asiatic Russia. It finds its principal use fresh, frozen, or lightly salted in the Orient.

● Seeking to make the North Pacific's rich salmon resource available to other parts of the world, authorities and scientists have sought to transplant the fish to what appeared to be physically suitable waters in the Southern Hemisphere or the Atlantic Basin.

The results, while interesting, have not as yet produced sufficient volume to be important.

Per Capita Consumption

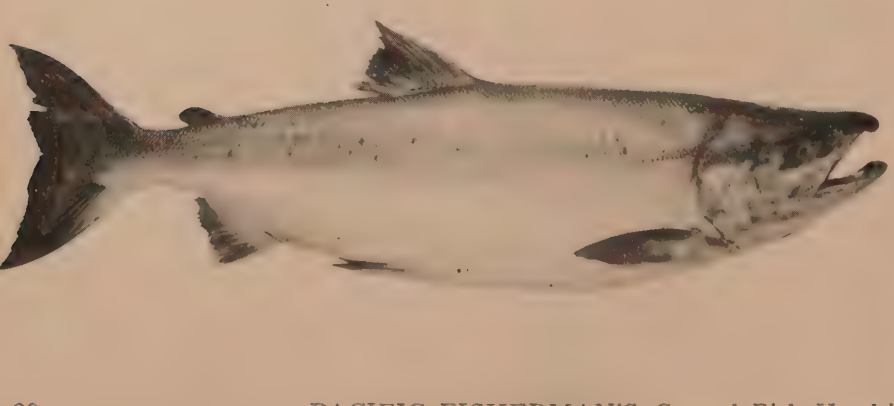
● Strong upward trend in the United States per capita consumption of canned tuna, is offset by declines in the average use of canned salmon and canned sardines among Americans.

This is plainly shown in an accompanying table.

It will be observed that in the years since World War II the per capita consumption of canned tuna in the United States has more than doubled. For the years prior to that war the per capita was less than one-third that of recent years. During the war, tuna production was so largely reduced, as result of the fishing fleet being largely requisitioned for military purposes, that the data for those years are not computed.

Decline in the per capita consumption of salmon and sardines is believed to be traceable directly to the smaller amounts available for consumption. This is particularly true in the case of sardines, reflecting the disastrous decline in the catch of California sardines.

Mackerel, the fourth great canned fish product, volume-wise, shows an up and down per capita movement, doubtless reflecting variations in the amount of fish available to the consumer and the inevitable effect of volume upon price and price on consumption, particularly where the item is a low-cost commodity such as canned mackerel.



Chum Salmon—

Slightly larger than the Silver, the Chum salmon is a wanderer of the high seas, where Asian and Alaskan races intermingle over enormous areas. The sea-run Chum resembles the Red salmon closely in external appearance, but the flesh is much lighter in color, the natural hue fading to a very pale pink in processing.

SALMON CANNING—

A Modern Industrial Art

• Salmon canning processes have been standardized in tep with technical developments since the industry had ts beginnings on the Sacramento River in 1864. The *rocesses* are standardized, but the *methods* by which they re applied differ somewhat with the regions and the haracteristics of the runs of salmon which support the anneries.

These differing methods are concerned in large degree vith how the fish are collected, conveyed, and protected luring this phase; and with how the cans themselves re filled.

• But before entering into the methods and processes, et us look for a moment into the history of a romantic ndustry.

George and William Hume and A. S. Hapgood, men rom Maine, started canning salmon on the Sacramento n 1864. Two years later they were on the Columbia River, vith a cannery at Eagle Cliff, Wash.; and in 1867 a annery was established on the Fraser River at New Westminster, B. C.

It was 10 years before canning came to Puget Sound; nd in 1878 the first canneries in Alaska were established t Klawock and Sitka. The industry thereafter progressed n great bounds, and it was only 1884 when canning was egun on Bristol Bay, still the greatest of all salmon anning areas.

• These early canners made their cans by hand, closed hem with solder, and processed the pack by long hours f boiling in water.

Salmon expeditions went to Bristol Bay in sailing vessels, ot only in those primitive days but until after World War . It was a long, uncertain voyage and from the time the essels left late in April until they returned in September o word was had from them. They vanished to sea, north nd west, and most of them came back.

It was a rough life and full of hazard, physically and economically.

The physical dangers largely have been overcome, but salmon canning—particularly in the North—remains a hard and hazardous business.

• The sails are gone from the sea; high-pressure, instrument-controlled retorts have replaced the process water bath; streams of collapsed cans flow through machines to emerge reformed and ready for filling; cans are filled, vacuum established, seamed and sealed at 250-plus per minute.

Mechanization rules in the canneries, but the salmon still must be caught by men with nets in relatively small boats, working at sea, as they have for 100 years.

• Mechanization and speed of processing in recent years have done much to protect the full quality of fresh salmon, to get the fish canned and processed while fresh and sound and sweet.

Vital contribution to the ever-improving procedure has been made in recent years by increasing application of refrigeration, afloat and ashore. In most salmon canning operations today the fish are collected and transported to the canneries covered with crushed ice, or in sea water chilled to the point of freezing.

Upon arrival at the canneries the chilled salmon pass through almost identical processes, varying little except that in a few instances the cans are hand-filled for fancy packs.

The enormous majority of salmon for canning are dressed on Iron Chinks, the remarkable machines which accept whole salmon and seconds later deliver the fish ready for the can, with head, tail, fins, and viscera removed. After inspection and the correction of any faults of the Chink's workmanship, the fish pass through parallel knives which cut them into slices fitting the height of the can into which the machine is to pack them. The cans are filled at rate approximating 250 per minute, and then pass before inspectors who again check workmanship before the

Supply of Canned Salmon, 1950-1960

Year	United States Pack	Percent of Total Supply	Imports	Percent of Total Supply	Total Supply	Exports	Total Available for U.S. Consumption
	Thousand Pounds	Percent	Thousand Pounds	Percent	Thousand Pounds	Thousand Pounds	Thousand Pounds
1950	206,871	99.8	419	.2	207,290	1,680	205,610
1951	222,987	99.7	568	.3	223,555	2,060	221,495
1952	214,289	95.7	9,544	4.3	223,833	1,427	222,406
1953	187,769	93.9	12,165	6.1	199,934	2,277	197,657
1954	199,810	94.6	11,371	5.4	211,181	7,227	203,954
1955	157,855	91.4	14,644	8.6	172,499	10,429	162,070
1956	168,250	85.4	28,802	14.6	197,052	5,213	191,839
1957	153,917	86.3	24,401	13.7	178,318	6,688	171,630
1958	179,134	86.0	29,226	14.0	208,360	9,227	199,133
1959	118,330	79.2	31,154	20.8	149,484	13,826	135,658
1960[1] ...	139,777	88.0	19,112	12.0	158,889	11,923	146,966

[1] Preliminary. Source: U. S. Bureau of Commercial Fisheries.

cans are salted, closed, evacuated of air, and hermetically sealed.

The closed cans are placed on end in steel trays or "coolers," which are stacked one upon another to the maximum height which cannery's retorts will accept. When the retort or autoclave is full of these "cars" of cans, the doors are closed, air exhausted and replaced with steam.

Process cook is usually conducted at 240° F., with the cooking time ranging from 50 minutes at this temperature for ¼-lb. flats to 100 minutes for 1-lb. talls. Half-pound cans are cooked 75 minutes. These times presume the cans will be cooled in water. Where air cooling is practiced the times respectively are 45, 70 and 90 minutes.

Where processing is done at 245° the cooking times are 10 minutes less than the figures given in each instance.

● Upon completion of the sterilizing cook the cans are washed thoroughly to remove grease and are cooled promptly, either by passing them briefly through cold fresh water or by placing the stacks in a well-ventilated area to cool by air circulation. If the cans are cooled in water they are removed while still warm enough for them to dry thoroughly in order to prevent any tendency toward rusting.

Cooled cans are generally placed in cases by machine for handling and storage; and usually are not labelled until ready for shipping.

● In addition to salmon canned by the process here described occasionally a packer will produce a specialty such as canned smoked or kippered salmon. In this case the salmon is usually brine-salted and then exposed to smoke before being cut into pieces appropriate for the can being used. Packing is alwavs by hand, and edible salad oil may or may not be added.

In normal salmon canning the general rule is that ¼-oz. of special canning salt is added to each 1-lb. can, and proportionately less amounts for smaller sizes. This amount has been found from experience to be necessary for proper seasoning, and at the same time acceptable to persons with low salt preference.

"Dietetic" salmon is available for persons requiring a low-sodium diet.

Collapsed Cans: Why?

● Collapsed or "semi-formed" cans were developed by the can manufacturing companies to meet the special needs of the Alaska salmon canning industry bv reducing the amount of freight paid on empty cans, and eliminating the necessity for maintaining a costly can manufacturing plant at remote Alaska canneries.

In collapsed or semi-formed cans the ends are manufactured complete at the can factories. The can bodies are formed and the side seam closed, but the ends of the bodies are not flanged. The cylindrical bodies are then passed through machines which flatten them. In this form they occupy only about 10% of the space required for a fully-formed can body.

At the cannery the collapsed bodies are fed into a machine which restores them to cylindrical form on a mandrel. Flanges are then rolled on the ends of the bodies, the bottom of the can is applied and double-seamed tight.

The cans are now ready to be deliverd mechanically to the filling machines in the cannery.

So successful has been the semi-formed can in reducin transportation costs that it is employed in other fisherie where transportation of materials is a substantial cost iten Thus the method is used in tuna canneries in Peru, and o oceanic islands as well as in sub-arctic salmon canneries.

Salmon Can Sizes

Can Name	Can Size**	Fill-in Wt. in Ounces	Cut-Out W in Ounc
No. 1 Tall	301x411	16.6	16.(
½-lb. Flat*	307x200.25	8.0	7.7
½-lb. Flat#	307x201.25	8.3	8.(
¼-lb. Flat	301x106	3.9	3.7

**Can sizes are stated in inches and 1/16 inches, with the diamet stated first, i.e., a 1-lb. Tall can is 3-1/16" in diameter and 4-11/1(high.

* Known in the trade as "Columbia River half." # Known in the trad as "Alaska half" or "Standard half."

"Curd" on Canned Salmon

● Occasionally the consumer on opening a can of salmo will observe a yellowish white or creamy substance, usuall on the surface of the can, or occasionally within th contents. Commonly this is a thin deposit on part of th surface of the fish, but may take the form of a spher perhaps as large as a small pea. It is quite firm to th touch.

In the salmon industry this is known as "curd."

It appears to result from the dissolution during th heat process of some of the complex proteins in the fis into simple proteins, which coagulate in the heat, muc after the manner of the white of egg.

This coagulated protein may occur in any salmon. Th material is entirely wholesome. Formation appears to b more pronounced in immature fish, or in salmon whic has been frozen before canning.

While it is generally regarded as impairing the appea ance of canned salmon, it is in no wise an indication c inferior quality or unwholesomeness.

Vacuum in Canned Seafoods

● Vacuum plays a significant part in the canning of se food, perhaps more than in most canned foods.

Its functional aspects are three:

1. Maintenance of can ends in concave position durin normal storage of the product. This is desirable as "built-in evidence of soundness of the contents. Bacterial spoilag usually caused the development of gas in the can, causin the ends to bulge. Maintenance of concave ends demo strates this has not occurred.

2. Reduction of the oxygen content in establishing th vacuum reduces the possibility of oxidative chemic changes which might impair the flavor of the contents contribute to corrosion of the interior surface of the ca

3. Prevents can distortion which might arise as resu of internal pressures produced in heat processing.

● Vacuum is produced in canned sea foods by sever methods, of which the commonest are:

1. *Mechanical evacuation*, in which the cans are intr duced into a vacuum chamber from which pumps draw th air. Cans are sealed hermetically while in the chamber.

2. *Steam-vac process*, in which jets of steam are directe into the open top of the can as the cover is being applie driving out the air in the headspace as the cover is seam tight.

Older methods, still employed widely for certain products such as canned sardines or liquid foods such as powders, include (a) the *exhaust box,* in which can and contents are heated while passing through a steam-heated box immediately before the cover is applied: (b) *heated contents* filled into the cans while hot from preparatory processing; or (c) by the addition of hot oil, sauce or brine.

Both of these latter two methods depend for their vacuum on the fact that heating expells the air from the contents, which subsequently shrink upon cooling, producing a vacuum in the can.

In sea food canning it is important that vacuum should not only exist in the can, but also that it should be *adequate.* Cans with low vacuum might have concave ends at the Alaska cannery, but if they were shipped to a high altitude or into the tropics the inadequate vacuum could be overcome by the reduced pressure at altitude or the increased temperature of the contents in hot climate.

Lack of vacuum is not necessarily evidence that the contents are not sound, but the consumer is always well advised not to accept cans whose ends are not in concave position.

How Many Salmon per Case?

• "Standard cases" of canned salmon consist of 48 cans of 1-lb. contents each; or 96 cans of ½-lb. size. Statistically all salmon are reported in cases of this equivalent.

Regardless of this fact, most ½-lb. salmon cans are packed in half-cases of 48 cans; and there is a growing tendency to pack 1-lb. Tall cans of salmon in cases containing 24 cans, again actually a half-case as compared with the standard.

• The "yield" of salmon, or the quantity of canned salmon which can be packed from a given quantity of fish, varies with the size of the individual fish in the sample.

As a rough rule-of-thumb, and disregarding this matter of fish-size/yield variation, it is common in the salmon industry to count 72 pounds as the amount of round salmon needed to pack a full case of 48 lbs. net.

The loss of salmon in dressing and removal of head, tail and fins runs from 23% to 24% for fish above 16 lbs., and 28% to 32% for small fish.

For small salmon a yield of 27 to 28½ cases of 48 lbs. net is expected from a ton of round fish; while for large fish the yield is expected to be 30 cases per ton.

Inspection Guards Quality

• Canned salmon in the United States almost always is inspected critically by experts of the National Canners Association before it is released from Pacific terminals for distribution. This inspection is in addition to, and usually in advance of, the scrutiny of the United States Food and Drug Administration. The present system was worked out a number of years ago as an effective means of dealing with a problem which was proving costly through delay in getting the seasonal salmon distribution under way.

The seasonal character of Alaska salmon production, which could not be put into distribution until it could be cleared by a numerically inadequate U.S.F.D.A. staff often caused serious economic hardship to the salmon industry. Delay in getting new-pack salmon into the consumers' hands might extend until late in the fall.

Accordingly the industry, the National Canners Association and the U.S. F.D.A. evolved an inspection program by which the NCA experts examine the salmon and issue certificates of quality to the packers, copy to the FDA. If there is anything questionable with respect to a parcel of salmon this is specially brought to FDA attention.

While the federal authority over salmon in interstate commerce, and the Food and Drug Administration's responsibility for it, never is suspended or withdrawn, the packer in possession of an NCA certificate of inspection and quality is in position to dispatch his salmon with assurance that the distributor, retailer or consumer will not subsequently suffer loss or embarrassment.

World Markets for Salmon

• Steady rise of the United States' population, coupled with a general gradual decline in canned salmon production during the period, in recent years has converted the United States from an exporter of canned salmon into an importer.

While American canned salmon exports in some years are substantial, not since 1951 has the out-flow exceeded the import trade in this commodity. Supplies of imported canned salmon for the United States come wholly from Canada and Japan.

Second only to the United States as a consumer of canned salmon is Great Britain, which produces none; but which draws heavily on the exportable surplus of Canada, Japan, and the United States, and the Soviet Union.

Formerly there was a considerable trade in canned salmon from the United States to the United Kingdom, but with the U.S. domestic market growing and its supply of salmon decreasing, this business has fallen markedly.

The United States in recent years has leaned heavily upon Japan as a source from which to supplement inadequate supplies, particularly of Pinks.

Australia was formerly an excellent market for canned salmon, and in recent years has been giving evidence of recovery. This business goes principally to Canada.

In the United States the principal markets for canned salmon are in the northern tier of states. Although the Southern states at one time used considerable quantities of Chum salmon, lately the trend has been toward orders for a proportionately large amount of the higher grades.

• Canada in recent years has sought to expand its domestic market for its most valuable canned fish product, and has succeeded admirably, although the export trade, particularly to the United Kingdom and the United States, remains a very vital factor in the commonwealth's salmon economy.

Japan uses substantial quantities of salmon, but not *canned* salmon to an important degree. The domestic trade for Japan's salmon production takes it largely in fresh, frozen and salted form.

World Per Capita Protein Food Consumption

Regions	Kilograms per Capita		
	Animal Protein Foods	Fish Protein Foods	Fish as Percentage of Animal Protein Foods
Far East	34.5	6.0	19.1
Near East	110.2	2.8	2.5
Africa	68.6	2.4	3.5
Latin America	141.1	4.9	3.5
Europe	174.7	13.6	7.8
North America and Oceania	502.9	5.2	1.0

—Source: FAO Second World Food Survey.

SARDINES—

Just what ARE sardines?

● Just what *are* sardines?

Why are some sardines tiny, and other quite large?

These are questions which are often asked, and understandably so, for the fact is that a sardine is not a specific kind of fish; and there are several species of fish which are canned and sold as sardines—and legitimately so.

In the United States sardines are officially declared to be small Clupeoid, that is fish of the Herring Family—which are packed tightly together in a can, usually after part of the natural oil and moisture has been removed. They are often packed with the addition of olive or salad oil, and sometimes with tomato or other sauce, but this is not necessary to their acceptance as sardines.

Thus under the official interpretation in the United States small herring, brisling, sprats and pilchards may be packed and sold as sardines—because they are Clupeoid fish.

Anchovies, which are closely comparable in character and quality, may not be packed and sold as sardines, because they are Engraulidae instead of Clupeidae—all very confusing, perhaps.

Among the members of the herring family are several which, by their very names, perhaps have a certain priority on the term "sardine" extending beyond the official definition, even as strict a one as that of United States officialdom. These fish of special priority are those whose generic names are related to Sardinia, the Mediterranean island west of Italy, which gives its name to certain species and the product itself. Such fish are *Sardinops,* as in the case of the California sardine; and *Sardinella,* a fish of the Mediterranean.

French and Portuguese sardines are packed from *Clupea pilchardus,* closely related to the California sardine.

Maine sardines are packed from small herring, *Clupea harengus,* as are Norwegian "sild" sardines. The higher-priced Norwegian "brisling" sardines are canned from small relative of the herring, *Clupea sprattus,* which Britain is called the "sprat."

South African and Japanese sardines are canned fro pilchards, fish very closely related to the California sa dine, which must be sold under the name of "pilchar in some overseas markets.

● Fish of the type usually canned as sardines may be t moist and perhaps too oily to be canned in their natu state, and in these cases a portion of the natural moistu is removed in advance of the actual canning process.

In most European sardine packs the fish are ligh smoked, which removes much of the moisture and natu oil. After being packed carefully in the can olive oil, other edible oil is usually added to the can. A distinguishi feature of most European sardine packs is in the lig smoky flavor.

In the case of American sardine packs, whether in Mai or California, the fish, cut to size appropriate for the ca are usually placed in the can after being seasoned a shrunk in a light brine, and then passed through a chamb where they are pre-cooked in steam. Upon emerging fro the pre-cooker, the cans are inverted on a mesh belt co veyor, where the oil and water expelled from the fish the pre-cook is drained away. This is usually replaced by sauce, tomato, mustard, or sometimes a vinegar or wi sauce. This is filled in the can hot and, as the fish are st hot from the pre-cook, the cans carry an adequate vacuu after being closed and given the process cook.

Packing procedure in South Africa and Japan follo the California method closely and the sardines canned those countries sometimes are imported into the Unit States since the abundance of sardines off Californ declined so severely.

California sardine—

Once yielding the largest catch taken by United States fishermen, California sardines some years ago, and coin dentally with closely related species in Asia, suffered a severe decline in abundance. This rich resource now giving evidence of rebuilding. The species, a true sardine, runs from 7 to 10 inches in length.

Anchovy—

This little fish in the United States is canned after the manner of sardines, but legal labelling requirements forbid it to be marketed as such, despite excellent quality.

● The California sardine fishery at one time, in the Twenties and Thirties, was the largest American fishery from the standpoint of tonnage. In the middle Thirties it amounted to as much as 600,000 tons a year, and the pack of California sardines in some years was more than 5,000,000 cases of 48 cans of 1-lb. ovals, or equivalent.

With the spectacular decline of the California sardine population the pack has been maintained at a reasonably adequate level by using a much larger proportion of the catch for canning.

The United States sardine industry formerly depended in large degree upon its export sales, California packers in particular selling heavily in Indonesia, the Philippines and other Pacific countries.

This is not to say that there was not then, as now, a heavy import trade in sardines. For many years the United States have imported substantial quantities of sardines from Europe, principally Norway, these products being of a type not packed in either of the American sardine-producing areas, California or Maine.

European type sardines, usually distinguishable in the statistics as those packed in oil, continue to represent much the larger part of the sardine imports in tonnage, and still more in value.

How U.S. Sardines are Caught

● California sardines are caught by means of purse seines, operating along the coast of Southern California on moonless nights, when the phosphorescence created by the movement of the fish in the dark waters reveals the presence of the schools to the fishermen.

Often such observations are assisted by electronic instruments, which indicate the depth as well as the density of the school.

New-caught fish are at the packing plants by morning, where they are unloaded by pumping from the boat's hold through special pumps which handle the fish without damage. Machines remove the scales, head, tail and viscera, wash out the body cavity, and cut the fish to correct length to fit properly the can being packed. The dressed fish are usually salt brined for about an hour for seasoning and to firm the flesh; and are then filled in the cans by hand. After the pre-cook previously described, sauce to the amount of 1.5 to 2 oz. is added to the 1-lb. can.

Processing time for the 1-lb. oval entering the retort at 70° is 75 minutes at 240°. Where the cans have come from the pre-cooker and enter the retort at about 130° the process cook is five minutes less.

Where California sardines are packed in brine "natural," without the addition of sauce, they are usually packed in round cans, principally the 5-oz. "jitney" can often used for tomato paste; the 8-oz. "buffet" can; or the No. 300 tall can holding 15 oz. net weight.

● California sardines continue at a relatively low level of abundance in comparison with the days of the resource's great yields. Scientists study the fishery carefully and are inclined to feel there is good possibility that several successful spawnings can bring abundance back to its former level.

While over-fishing may have played a significant part in the decline of sardine abundance, the lack of a highly

Supply of Canned Sardines Obtained From Domestic Pack and Imports, 1950-1960

Year	United States Pack[1]	Percent of Total Supply	Imports[2]	Percent of Total Supply	Total Supply
	Thousand Pounds	Percent	Thousand Pounds	Percent	Thousand Pounds
1950	318,139	90.7	32,485	9.3	350,624
1951	168,160	85.2	29,289	14.8	197,449
1952	87,425	73.8	30,982	26.2	118,407
1953	67,972	54.2	57,365	45.8	125,337
1954	128,892	74.0	45,251	26.0	174,143
1955	93,348	75.2	30,816	24.8	124,164
1956	86,179	74.8	29,041	25.2	115.220
1957	74,293	68.3	34,523	31.7	108,816
1958	149,155	79.2	39,173	20.8	188,328
1959	74,979	69.6	32,756	30.4	107,735
1960[3]	74,458	66.2	37,967	33.8	112,425

[1] Includes the pack of Maine and Pacific Sardines. [2] Includes sea herring. [3] Preliminary. Source: U. S. Bureau of Commercial Fisheries.

Supply of Canned Sardines, 1950-1960

Year	U. S. Production		Imports[1]		Exports		Total Supply Available for U.S. Consumption
	Maine	Pacific	In Oil	Not in Oil	In Oil	Not in Oil	
	Thousand Pounds	Thousand Pounds	Thousand Pounds	Thousand Pounds	Thousand Pounds	Thousand Pounds	Thousand Pounds
1950	89,953	228,186	22,573	9,912	[2]	[2]102,321	248,303
1951	39,236	128,924	19,324	9,965	[2]	[2]126,661	70,788
1952	82,622	4,803	20,887	10,095	3,250	36,620	78,537
1953	65,110	2,862	23,094	34,271	773	9,184	115,380
1954	68,677	60,215	22,294	22,957	816	16,441	156,886
1955	29,691	63,657	20,930	9,886	1,179	45,431	77,554
1956	52,216	33,963	18,581	10,460	229	39,445	75,546
1957	51,894	22,399	20,127	14,396	379	14,922	93,515
1958	49,139	100,016	18,001	21,172	645	17,816	169,867
1959	41,023	33,956	21,153	11,603	1,271	37,453	69,011
1960[3]	46,744	27,714	21,235	16,732	263	20,955	91,207

[1] Includes sea herring. [2] Data on sardines canned in oil have been combined with canned sardines not in oil [3] Preliminary.
Source: U. S. Bureau of American Fisheries.

successful spawning within the course of a number of years reduced the population to such low levels that recovery has been slow even at a greatly reduced intensity of fishery.

When sardines were abundant it was found that the resource was sustained in large degree by a heavy "year class," resulting from a specially successful spawning about once in four years. As the life of the sardine is rarely more than seven years, failure to develop a markedly successful spawning in a span of about eight years can be disastrous.

This has been the history of the Pacific sardines on the Asian side as well as that of North America, and eventual full recovery can be anticipated on the record of the past, supported by the relatively limited intensity of the present fishery. With almost the entire catch going into cans; and with imports supplying a substantial part of the demand the reduced population of sardines has excellent biologica opportunity to recover its former abundance.

Potential in pilchard sardines of the type canned in th Pacific by the United States and Japan and in South Afric and South-West Africa is very great from the standpoin of food volume. The tonnage is great and the fish readil caught.

There is a further economic potential in the sardine re source which would appear to depend for its full realizatio upon the development of canned sardine products com manding on their merits higher prices and widesprea popular preference. Efforts along these lines have bee made by a number of American canners, with at leas sufficient success to point the way toward further up-grad ing of Pacific canned sardine products with the ever-prom ising increases in fish products consumption.

Canned Herring's Potential Vast

● Herring frequently is referred to by scientists and statisticians as the most abundant fish in the sea, and the species making the widest contribution to Man's economy.

Whatever the exact facts may be, it is plain that (1) the herring population is enormous, readily available, and cheaply fished; (2) that herring are rich, nutritious, and generally well appreciated as food; (3) that in spite of low cost and desirability, abundance of herring is so great that only a relatively small portion of the permissible annual catch is used directly for human food.

Most herring now being taken is used for the manufacture of fish oil and meal. The meal in particular is used largely for feeding domestic animals.

The probability is that Man formerly used a larger percentage of the herring catch for food than is now the case. This was because the amount used in salted form appears to have declined, while the technology of fish reduction and the demand for fish meal has risen prodigiously.

Future prospect for expansion of Man's direct food use of herring appears to lie primarily in canning, where there is a well-developed and growing production and demand.

Canning of larger herring, usually in the form of kippers, or as kippered fillets of herring—commonly called "Kipper Snacks"—is a well developed industry in Norway, and t some extent in Great Britain. Minor quantities of fis packed in this manner are canned in Canada.

During times of national emergency and great deman for food British Columbia has provided large quantities c canned herring, generally packed in oval tins, somewha after the manner of California sardines. Efforts to continu production of this item in times of normal demand hav not met with encouragement.

● Future of herring canning appears to lie in the way c mechanization of the filleting, precooking, smoking c other preparation method, and offering an attractive a well as nutritious product at a moderate price.

Alaska and Canada, with remarkable resources of he ring, find utilization of the resource for canning hand capped by costs arising primarily from labor charges an the lack of sufficiently complete means of mechanizatio by which the prohibitive labor costs can be avoided.

● Herring are widely available throughout the norther hemisphere, and closely related forms also abound in th cooler waters of the southern hemisphere.

They are usually caught for canning by means of purs

Pacific mackerel—

Pacific mackerel is smaller than the Atlantic species, and is used largely for canning. It is a rich, hearty, relatively low-cost canned fish; a real bargain in protein food.

seines, but the use of ocean drift gillnets is common in the British and European fisheries. Mid-water trawling is coming into use in the catching of herring, where it permits relatively small boats to participate.

In British Columbia waters herring are extremely abundant during the winter months, and some enormous catches are made. The record stands at something like 1,200 tons of herring in a single set of the net, while catches in the neighborhood of 1,000 tons are relatively common.

Canned Mackerel, Protein Bargain

Principal production of canned mackerel in the United States is in Southern California, where two distinct fish are used: Pacific mackerel and Jack mackerel.

The first of these fish, *Pneumatophorus diego*, is a true mackerel; while Jack mackerel, *Trachurus symmetricus*, actually is a member of the Jack family, but is so closely similar to mackerel, and has been called Jack Mackerel in the trade for so many years that the term is now officially acceptable in the United States.

Mackerel of both kinds also are canned to a considerable extent in Japan; and in South Africa the pack of Jack mackerel is substantial.

Japan also packs a related form, the Saury, sometimes called mackerel-pike; but here the available fish supply usually far outstrips the demand for the canned product.

Mackerel is usually caught by means of purse seines, although the Pacific variety is also taken off California by means of dip nets. The fishery is often close to the canneries and the catch is promptly packed. Preparation is simple at present, the mackerel for the standard pack generally being dressed on machines similar to those used for sardines. The fish are filled into tall round cans by hand, and then the cans are put through an extra-length exhaust box which serves to pre-cook the fish and firm them by removing moisture before the sterilizing process cook. The cans are usually drained after emerging from this pre-cook, and are then salted either with dry salt or a measured amount of brine.

More sophisticated packs of mackerel occasionally are made. In these the fish are usually machine filleted and the fillets are then either smoked or packed in a spiced wine sauce. Packs of this sort are always made in flat oval or oblong cans, usually containing about 8 oz.

Bonito is the Spanish Beauty

● Bonito is a fish of the warm seas, closely related to the tunas, and sold under that name in Great Britain, although in the United States labelling bonito as tuna is not permissible.

The word bonito means "beauty," and the fish is truly that. It resembles the Skipjack tuna rather closely in appearance, and in Japan no distinction appears to be made between the two in common parlance.

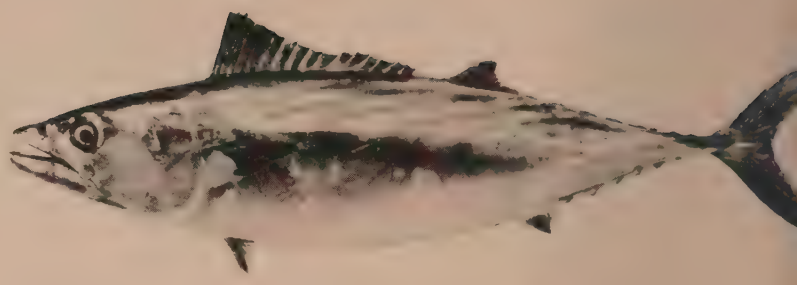
Bonito is taken in the seas off Southern California, the

Jack mackerel—

Popularity of Jack mackerel as a canned sea food has risen spectacularly in recent years, and it forms one of the world's prime sources of marine protein food at low cost.

Bonito—

The name means "Beauty" in Spanish—and the fish is all of that. While a near relative of the tunas, Bonito is not accepted under that name in the United States, although it is in Britain. Principal world production of canned Bonito is in Peru, with markets in the United States and the United Kingdom.



species there being *Sarda lineolata;* but the bonito fishery of real consequence in canning is along the coast of Peru and northern Chile, where the species taken is *Sarda chilensis.*

In South America bonito is caught by means of purse seines and canned after a manner closely approximating that used for tuna.

The dressed fish are pre-cooked and the loins of clear, light meat are freed from the skin, bones and dark meat. The loins are cut into pieces which, placed in the can on end, will produce an appropriate fill. As the loins are smaller in section than in the case of tuna, the number of pieces in the can is greater. The fish is somewhat softer than any of the canned tunas, but the texture is pleasing and the flavor excellent.

Virtually the entire South American bonito pack is exported, either to Great Britain or the United States. The two markets have somewhat different requirements, that in the United Kingdom being partial to very fi bonito, for which it is willing to pay a premium.

The United States market, on the other hand, pref bonito of softer texture and the richer, fuller flavor whi accompanies it.

Bonito resources of the Peruvian Current defy me urement, but patently are enormous, being ranked amo the quality sources of canned fish which can provi readily for vastly increased production as the mar expands.

Annual pack in recent years has ranged from 1 milli to 1.5 million cases, varying almost altogether with t vigor of the market, particularly in Britain. Peruvian bon is imported into the United States to the extent of abo 750,000 cases annually. Although it may not be labelled marketed as tuna, there is every reason to believe that mu of it actually is consumed as tuna salad and tuna san wiches.

SHRIMP is Leader In Canned Shellfish

● Canning of shrimp is a secondary factor today in an industry which has grown prodigiously in recent years, and to which the development of freezing and packing techniques have made inestimable contribution. Shrimp as a product seems to know no limit of popularity. The market appears insatitable, but primarily for the frozen product.

But canned shrimp, regardless of its secondary position, is still first in value among American canned shellfish.

In the United States the great majority of canned shrimp is packed on the coast of the Gulf of Mexico.

In recent years a shrimp canning industry has developed on the Pacific Coast as result of the discovery of substantial quantities of shrimp from Southern California north and west to Kodiak Island, Alaska, and perhaps beyond. Greatest abundance appears to be in the northerly and westerly waters.

Virtually essential to the economic development of the new-found resource, are peeling machines which have recently become available to the industry. These machines, designed particularly for peeling small shrimp, have made it possible to use for canning the vast quantities of Pacific Ocean Pink shrimp, as the small Pacific varieties are generally known.

● Shrimp canned in the greater industry along the coast the Gulf of Mexico are generally of five species.

Shrimp are caught by means of otter trawls, althou beam trawls are used in California and some parts Alaska. Shrimp of size and character intended primar for canning are chilled with crushed ice in the hold the vessel, and landed whole as soon as possible af catching.

Upon landing, the shrimp are held under refrigerati in crushed ice or brine for a time to release the meats fr the shells, thus facilitating the peeling operation. Af controlled chilling, the shrimp are put through the peel machines, which gently loosen and rub away the she freeing the meats and separating them from the shells.

The shrimp meats are now blanched in boiling br for a period of about five minutes. This fixes the co of the shrimp, curls the individual tails, and firms product for weighing into the cans.

Shrimp are usually packed in fully enameled cans. least a half-dozen can sizes are used for shrimp, w drained weight of contents ranging from 4.75 oz. to 38 Shrimp are canned both in wet-pack and dry-pack, difference being that the dry-pack shrimp are closed un

mechanical vacuum without the addition of brine; while n the wet pack boiling water and salt, or boiling brine, are added to the can, which is then closed for processing without other means of establishing vacuum.

• U.S. Food and Drug Administration standards regulate the fill-of-container in shrimp canning. The rules are these:

1. In wet-pack shrimp the drained weight of the shrimp n the can shall be not less than 64% of the weight of water which the can will contain.

2. For dry-pack shrimp the weight shall not be less than 60% of the water capacity of the container, except that in the 211x400 or "No. 1 picnic" can most commonly used for this pack the weight of the shrimp shall not be less than 6.5 oz.

Individual shrimp meats generally are size graded so the contents of the can will be reasonably uniform size. Market preference or abundance may be reflected in varying prices for different size counts.

• Shrimp are produced in many parts of the world and the most insatiable appetite for this shellfish in the United States has resulted in the development of a substantial import trade. This is largely in frozen shrimp, however, although there appears to be a growing import trade in canned shrimp, notably from India.

In point of volume and value, canned shrimp is the most important canned shellfish product of the United States, with an annual production very close to 1 million standard cases (48 cans of 5 oz. contents) and an annual value approximating $17 million.

Of this amount at present only about 60,000 cases are canned on the Pacific, while Louisiana accounts for more than half of the total production and Mississippi approximately 25% of the whole.

• Lobster canning was among the very first applications of the canning process in the United States, but it has virtually disappeared with the development of the live or frozen lobster trade. Only a handful of canned lobster specialties are packed in New England at present.

World supply of canned lobster comes almost wholly from the Maritime Provinces of Canada, so far as true lobster is concerned.

Spiny lobster is canned in South Africa and a number of other countires, usually under the name "Rock Lobster," but here again the development of facilities for freezing spiny lobster or crayfish tails, and consumer enthusiasm for the product in this form, has reduced "Rock Lobster" canning to a position of relative insignificance in comparison with the fresh and frozen business in these shellfish.

Canned Oysters and Specialties

• Canned oysters, with annual production in the United States ranging between 400,000 and 500,000 cases annually, plus 100,000 and more cases of stew, soup, smoked and other oyster specialties, rank among the leading canned shellfish items.

In the United States oysters follow shrimp and clams and clam products, and narrowly exceed canned crabmeat in volume and value.

As in the case of shrimp, oyster canning is dominated by the Louisiana industry, whose production is about 40% of the national total.

South Atlantic and Gulf states account for about three quarters of the canned oyster business in the United States. The remaining 25% is on the Pacific Coast; and that area appears to dominate the oyster specialty business.

Oysters of two varieties are canned in the United States: 1, the Eastern oyster, *Ostrea virginica,* packed on the Atlantic and Gulf coasts; and 2, Pacific oyster, *Ostrea gigas,* grow on the Pacific Coast from seed imported from Japan. The native oyster of the Pacific Coast, generally known as the "Olympia oyster," *Ostrea lurida,* is a tiny creature and never canned.

Oysters are grown on beds which are subject to regular inspection by the health authorities and which must be certified as sanitary.

In some large oyster plantations use is made of continuous mechanical-hydraulic harvesters which pick-up the oysters from the bottom, sweeping them onto a belt elevator, where they are washed thoroughly as they are discharged on the barge.

This matter of thorough washing is associated with all methods of oyster harvesting, and it never ceases entirely until the oysters are in the can.

On the Gulf coast oysters for canning are steamed until the shells are partially open and the oyster meat firmed.

After the shells have opened the oysters are shucked and the meats passed to the washing process.

Pacific Coast oyster canners a few years ago adopted a different method of opening oysters for canning. In this case the thoroughly washed oyster shells are opened by hand while the oysters are alive, exactly as if they were to be marketed fresh. After they have been graded and thoroughly washd the oyster meats are blanched for a few minutes in hot water, when the firmed meats are again washed, again graded, and finally weighed into the cans.

While obviously there is more labor involved in opening live oysters, the meats remain plump and full of flavor, tender and unshrunken. They must be firmed before canning, of course, but this is accomplished by the closely controlled blanching process, in which time and temperature are precisely regulated.

Canning follows the final wash with the oysters being weighed into the cans, which are then filled with hot water at 180° F or higher temperature salted to the degree necessary to season the oysters. Filled with water at such temperature, the cans establish a satisfactory vacuum on cooling after the process cook.

• In recent years the canning of oyster stew, or soup as some packers still call their product, has become an important factor in the Pacific oyster industry. In most years the volume of oyster stew in standard cases exceeds the Pacific Coast canned oyster pack, although obviously the amount of oysters used in the stew is much less than in an equal volume of canned oysters.

United States Food and Drug Administration standards for canned oysters provide that the drained weight of oysters from a container shall not be less than 59% of the water capacity of the container. This applies to canned oysters of all sizes and species and in cans of various sizes.

• Oyster canning in the United States holds at a remarkably even volume level which since World War II has ranged only from a low of 357,000 cases in 1948 to a high of 559,000 cases, attained in 1955.

The areas producing most of the oysters for canning have not been seriously affected by the mortalities and declining productivity which has proven such a serious burden for the oyster industry in New England, Long Island Sound, Deleware and Chesapeake Bays.

Clam Canning, a Growth Industry

● Among United States canned shellfish, clams have shown the strongest growth trend since World War II, and in value canned clams and clam products—chowder, juice, broth, nectar, etc.—exceed any other American canned shellfish except canned shrimp.

The steady rise of clam and clam products volume in the United States has produced an upward trend which has climbed from 1,179,000 cases in 1948 to 2,057,000 cases in 1960 in an almost constant advance.

Canned clams per se had their post-World War II low in 1947 when the pack was 106,000 cases. In 1960 the total was 741,000 cases. In between the upward trend has been virtually unfaltering.

Reason?

Discovery that along the Atlantic Coast from New England to Chesapeake Bay hardshell clams (*Venus mercenaria*) populate the sea bottom to a considerable distance from the coast, and that they can be harvested economically by means of heavy steel dredges whose weight presses a rake into the sea bottom as the dredge is towed along by a power vessel. The rake plows up the clams and they are caught in a chain-link mesh bag dragged behind the dredge frame.

These clams have been canned on the Atlantic Coast for generations, but the greater abundance, larger size and availability of the off-shore clams to mechanical dredging have given the industry remarkable stimulus.

Canned clams of good quality are available on the markets throughout the United States at relatively lower prices and in more adequate supply than ever in the past.

The increase in U.S. clam canning has been spectacular in recent years, and this has been passed over in substantial degree also to the canning of clam specialti some of which—notably the broths, nectars and juices actually are by-products of clam canning; while the cho ders, bisques and specialties build their substantial volu on a relatively small quantity of clams as such.

Actually in some years the clam specialties have doubl canned clams in volume, and in most years they run su stantially ahead of the primary produce in volume—a ca of achieving maximum economic recovering from a ba food material.

● On the Pacific Coast clam canning is a minor factor a in recent years has been confined largely to razor cla (*Siliqua patula*), perhaps the finest of all clams, which a found only on the fine sand beaches of the Pacific Co from Southern Oregon north and west to the Aleuti Islands, but never in great volume, and in numbers whi may vary strikingly from year to year.

Razor clams must be harvested only by hand digging, part because of the softness of the surf-beaten sand which they dwell, and in part because official regulatio have prevented attempts to develop mechanical means harvesting them. Apparent tendency of the population decline under increasing exploitation has dictated th restrictions.

Further, razor clams are extremely popular with va tionists who have access to the beaches and in many are the drain of personal use digging has held the populati down to a level where commercial operations have be closely curtailed or altogether forbidden.

Finally, the excellent quality and relatively low pr of the off-shore clams from the Atlantic Coast, and so imports also, has imposed a severe restrictive influen on the development of razor clam canning, whose r material must be dug by hand from remote beaches the Alaskan Coast.

● Where clam juice is canned it is recovered as a b product of the steaming process by which the cla shells are relaxed. Clams characteristically release a su stantial quantity of flavorful liquid when opened unc the influence of heat. This is collected, clarified, strain and canned or bottled, with or without dilution, dependi upon the variety of clam and the flavor desired in t product.

● Canning of clams is a highly variable process, dependi upon the variety of clam, somewhat upon the region fr which the clams come, whether they are canned whole minced, and the fineness to which they are chopp Accordingly, methods and processing times are quite va able and generalization is inadvisable.

Clam juice is often packed in bottles, and frequently cans up to No. 10 sizes.

Minced clams are often canned in ½-lb. flat cans, t container being practically standard for razor clams.

● Imports of canned clams from time to time have exert some pressure on the United States industry; but since t rise of ocean dredging for Atlantic clams the supply a price situation in the U. S. market appears to have react against the import trade.

Weight of Standard Cases

(Various sea foods are packed in cases of different sizes or numbers of cans. The weight of the food in the principally used, or "standard" case for each item are shown. Where "cases" are spoken of in this report reference is to "standard cases" of the weight of contents shown here.)

Product	Pounds Per Case
Sardines:	
Maine	23.4
Pacific	45
Tuna and Tunalike Fishes:	
Solid	21
Chunks	19.5
Flakes	18
Mackerel	45
Alewives	45
Anchovies	31.25
Shad	45
Fish Flakes	48
Oysters	14
Shrimp:	
Wet Pack	15
Dry Pack	15
Clam Products:	
Whole and Minced	15
Juice, Chowder, Broth, etc.	30
Crabs	19.5
All Other	48

—Source: U.S. Bureau of Commercial Fisheries.

King Crabs provide most of the world's canned crab, and are found on both sides of the North Pacific from Southeast Alaska to Northern Japan. They are huge fellows, averaging about 10 lbs. in weight. Many specimens reach 15 lbs., with a leg span of as much as 5 ft.

King Crab is Canned Crab King

● Crab of three distinct varieties contributes to the supply of this canned sea food delicacy for the United States market. Incidentally, more than half of that supply at present is imported, almost wholly from Japan.

Three types of crab—and they are all very different in the product derived from them as well as in their outward appearance—are:

King crab, *Paralithodes camtschatica,* produced in north-Japan, the Sea of Okhotsk, Kamchatka, along the Aleutian Island, the coast of Alaska, Cook Inlet and Kodiak Island. This crab is a huge fellow, often reaching 15 lbs. in its live weight. It accounts for more than half of the canned crab produced in the world as well as of that consumed in the United States.

Dungeness crab, *Cancer magister,* the dominant Pacific crab, which is canned from northern California north through Oregon, Washington, British Columbia and Alaska as far west and Prince William Sound, where it begins to impinge upon the King crab fishery.

Blue crab, *Callinectes sapidus,* is canned on the Atlantic and Gulf coasts, where it is the principal species of crab. Much smaller than the other commercial crabs cited, the great majority of the Blue crab production is marketed in fresh or frozen form.

● Prior to World War II crab canning was a very minor factor in the United States and Canada, virtually the entire market being supplied by imports from Japan; while the domestic crab production was marketed fresh, and to some extent frozen.

Suspension of canned crab shipments from Japan during the war, and for several years thereafter, stimulated, the development of North American crab canning. The largest pack of canned crab the United States has ever produced was in 1948.

Moreover, the successful development in North America of crab canning techniques, and the development of market acceptance for the domestic varieties gave rise to an established industry which maintained its position following the resumption of King crab shipments from Japan.

Again, in the years following World War II Americans undertook the development of King crab resources adjacent to the Alaskan Coast. The result has been a substantial and growing industry from Cook Inlet westward. Much of the American production of King crab is marketed fresh, but in recent years canning of this variety has increased in American plants, with the result that in 1960 the pack of U.S. canned King crab was twice that of Dungeness crab on the Pacific Coast and, indeed, was approximately half the total domestic production of canned crab.

At that, the domestic production of canned crab in the United States in 1960 accounted for only 4% of the total available supply, 53% being imported, largely from Japan.

● *King* crab yields a spectacular canned product, the meat being white, with the surface of the leg and claw meat bright red when cooked. Thus the product closely resembles lobster in appearance, and to some extent in flavor. The pieces are large and the pack most attractive. In Japan this crab is canned to a limited degree in shore plants located on Hokkaido, the northern island; but most of the production is canned on factoryships operating in the Okhotsk Sea and Bering Sea. Actually it was the sending of King crab expeditions into eastern Bering Sea and Bristol Bay in the early 'Thirties which initiated Japan's operations in the eastern Bering and North Pacific which have grown so spectacularly since 1954.

Alaska King crab are identical with the Japanese in all respects. They are caught in great pots 6′ in diameter and 3.5′ high.

U.S.S.R. has substantial King crab production on Kamchatka and in Bering Sea.

● *Dungeness* or Pacific crab abound along the Pacific Coast, and only a relatively small percentage of the catch is canned. This crab reaches a maximum weight of 3.5 lbs., but the average market crab is about 2 lbs. The body meat, of which there is much more proportionately than in the King Crab, is white, but the leg and claw meat as a surface network of red or brownish purple coloration. In most canned packs both body and leg meat are included in the can in approximately equal proportions. The flavor of this crab is exceptionally fine and it is esteemed above all other varieties on the Pacific Coast, where the market of course is most familiar with it.

● *Blue Crab* canned on the Atlantic and Gulf coasts is a small creature and only the body meat is utilized. This meat is entirely white and contrasts sharply in appearance with the two major components of the canned crab pack. For this reason it is not marketed in the western part of the United States.

Other varieties of crabs are canned to limited extent,

Dungeness or **Pacific** crab, most widely distribut and important North American species, but ra ing second as a source of canned crab. Avera weight, 2 lbs.

but this is important only to the degree that it may point to possible future developments.

In Japan limited packs are put up of the *Kegani* and *Snow* crabs. These types are superficially similar to the long-legged King crab, but are much smaller and the canned product is priced somewhat lower.

● Crabs are always kept alive to the moment the canning process begins. They are butchered by jerking the back off on a hook, when the viscera are swept away on a horizontal knife, followed by thorough washing; from which the crab sections, the body and legs from each side, go into a short cook in boiling water, usually in a continuous cooker in which the crabs are carried through the cook in a precisely regulated period. As soon as the crab has cooled slightly "shakers" remove the meat, most of it by rapping the shells on the edge of a stainless steel pan into which the mean falls. Body meat and leg meat are kept separate.

The picked meat is washed and then passed through a brine tank in which the brine is of density which will float the meat while bits of shell sink.

All crab has the peculiarity under certain conditions of developing areas of bluish coloration during the canning process and subsequent storage. Exact cause of this condition is not fully understood, but one authority says it "is believed to result from the combination of the copper present in the crab's blood and flesh with the ammonia, sulfides and other nitrogen compounds that are liberated from the meat by the heat of the canning process."

This blue discoloration apparently is not unwholesome, but its presence reacts seriously against the marketability of the affected product and is the principal technical handicap of crab canning. The Blue crab is much more s ject to development of the blue discoloration than ot varieties.

Acidulation of the crab meat, sually with citric acid, used by some packers to prevent discoloration. Oth feel that the best preventive is accelerated handling of crab after it is killed and thorough washing of the p cooked meat to remove any coagulated protein which formed as a curb during this initial cook.

Formerly crab meat was always canned in parchme lined tins, but this is no longer considered necessary, to the improved enamel now available.

The Japanese, who originally developed the methods processes of crab canning, have found that a low tempe ture pre-cook to coagulate the crab meat and facilitate removal from the shell contributes valuably to prevent of blue discoloration, presumably by reducing the bre down of proteins and their subsequent coagulation int curd susceptible to the development of the undesira blue discoloration.

Great care should be exercised in the processing of c meat, for the production is susceptible to quality impa ment by overcooking. Processing is often done in sm retorts, as it is particularly desirable that there should be delay between closing the cans and the processing cook.

● Crab meat generally is packed in ½-lb. cans, 24 to case. Standard case remains at 48 such cans, but in pres practice the two-dozen case is more widely used th the twice-as-large standard case. Three sizes of "halv are most widely used for canning crab, these being 3 201.25, the 307x113 and the 307x208 cans. Drained wei of contents, respectively, is 6.5 oz., 5.25 oz., and 7.5 oz.

Supply of Canned Crab Meat, Various Years

Year	United States Pack	Percent of Total Supply	Imports	Percent of Total Supply	Total Supply	Exports	Total Available for U.S. Consumption
	Thousand Pounds	Percent	Thousand Pounds	Percent	Thousand Pounds	Thousand Pounds	Thousand Pounds
1939	640	4.5	*13,507	95.5	*14,147		*14,147
1948	*4,306	76.3	1,337	23.7	5,643	73	5,570
1950	2,675	39.7	4,070	60.3	6,745	20	6,725
1951	2,924	59.8	1,968	40.2	4,892	47	4,845
1952	1,678	44.7	2,080	55.3	3,758	33	3,725
1953	2,240	36.0	3,983	64.0	6,223	20	6,203
1954	3,013	51.2	2,867	48.8	5,880	19	5,861
1955	1,934	28.1	4,951	71.9	6,885	19	6,866
1956	2,431	30.1	5,640	69.9	8,071	17	8,054
1957	3,013	32.8	6,185	67.2	9,198	29	9,169
1958	2,804	32.4	5,854	67.6	8,658	[2]	8,658
1959	2,942	28.7	7,304	71.3	10,246	[2]	10,246
1960[1] ...	3,991	47.0	4,508	53.0	8,499	[2]	8,499

[1] Preliminary. [2] Data not available. *Record. Source: U. S. Bureau of Commercial Fisheries.

Pet Sea Foods Vast in Volume

Canned pet foods based on or consisting wholly of fish ve become a prodigious business.

In fact, the amount of pet food canned from fish in e United States in 1960 was greater than any other nned fish item—greater than tuna, more than twice as eat as salmon.

If this seems incredible, let us look at the facts. In 60 the pack of pet food from fish was 8,783,000 cases, the basis of 48 lbs. per case.

The pack of tuna in that year was 15,350,000 cases, *t the cases were less than half as large.*

The pack of salmon in that year was 2,913,000 cases of e same size as the pet food standard, a ratio of 2.9 : 8.7.

The value of pet food canned from fish in the United ates in 1960 was $43,961,000, more than that of any ner category of canned fish save tuna and salmon.

Fish pet food canning has three great centers, each proximately equal in their 1960 production. They are: aine and Massachusetts, 2,524,000 cases; Mississippi, 933,000 cases; California, together with American Samoa d Puerto Rico, 2,936,000 cases.

Pet food packed in the United States is subject to the ne requirements of soundness and wholesomeness as is man food. It is subject to inspection by the U.S. Food d Drug Administration, and must be packed in sanitary nts, by sanitary methods, from material which is not oiled or tainted.

Material from which pet foods are packed generally mes from two sources: (1) Whole fish, which may or ay not be regarded as suitable for human food; (2) rtions of fish discarded in the preparation of fish for man food.

In the first category go such species as whiting in times excessive supply; menhaden, the mainstay of the great ssissippi pet food canning business; and mackerel and rdines in California.

Perhaps the most important single element in the second category is the red meat of tuna which is excluded from the product prepared for human food not only because it is dark in color but also because it has a rather strong, heady flavor. This product in particular is a favorite of cats.

In the case of pet foods packed from the red meat of tuna Vitamin E balance is established by an additive, but otherwise the product is all tuna.

Where pet foods are produced from whole fish in many cases cereal binder and often vegetables are added for proper balance.

Codes and Their Functions

● Cans of fish and sea foods carry on one end, almost without exception, letters and numbers which in code tell the packer the kind of fish in the can, the plant in which it was packed, the day or half-day it was canned, and in some instances other information, such as the area or fishing boat from which the fish was received.

These marks on the cans are called "code-marks," and all cans bearing the same markings as a group are called a "code." Thus, a parcel of Red salmon packed at the Boreas Bay cannery on the morning of the ninth day of packing (July 5, perhaps) 1961 represents a "code." It is kept together in the warehouse and in shipping.

Received at the terminal, the code is sampled, the number of cans drawn at random being governed by a rule which applies to the number of cases in the code.

If the samples are all satisfactory the code is certificated as acceptable for distribution.

If there are irregularities, the code is held and subjected to further sampling and inspection.

In this way the codes—and the code numbers on the cans are always also marked on one end of the cases in which they are packed for shipment—enable the packer to segregate any parcels. They can be traced to the cannery and the day of packing; perhaps even to the very machine which packed the product in question.

Code marks are little things, but they can be very important indeed to the fish and seafoods canner and his customers, providing protection and safeguards and limiting the task of correction.

Acknowledgements

In preparation of this *Hand-i-Book* the staff of PACIFIC SHERMAN in indebted to a number of organizations, and rticularly to individuals on their staffs and to their pubations. Their assistance has been as valuable as it has en freely given, with cordial cooperation.

Help and encouragement has come from many quarters, t in particular we wish to express our special gratitude these organizations and members of their staffs:

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Continental Can Co., A. L. Feather.

National Canners Association, George E. Steele Jr., Walter V. Yonker.

United States Fish and Wildlife Service, Bureau of Commercial Fisheries, E. A. Power, Charles R. Butler, Maurice Stansby, Jefferson Collins.

It is with regret that we cannot express our appreciation directly to the many nameless writers, artists and technologists who have contributed to the published data which these organizations have so generously made available to PACIFIC FISHERMAN for this third edition of its *Hand-i-Book.*

All graphs used in this *Hand-i-Book* were from the U.S. Bureau of Commercial Fisheries, save for that depicting the Total Catches of the Eight Leading Fishing Nations, which was prepared by the Food and Agriculture Organization of the United Nations.

From Sea to Serving

1. Tuna purse seine catch
2. Salmon cannery, Puget Sound
3. Salmon canning
4. Salmon fishing, Bristol Bay
5. Tuna canning, Puerto Rico
6. Tuna purse seining
7. World tuna canning center—California

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)id Japan Set Red :ecord with Catch)f Alaska Salmon?

• How many Red salmon of Alaska origin did the Japanese high seas operations take in 1961?

How many Reds did they catch all told?

Didn't the Red pack set a record?

United States observers have no definite answers to these questions, but they are beginning to feel that the catch taken from the Bristol Bay stock was very large — and probably accounts in full for the fact that the run to Bristol Bay fell short of forecasts by 7 to 8 billion Reds.

In Japan there seems to be the impression that about 70% of the Japanese catch in 1961 consisted of Reds.

Moreover, usually well informed sources in Japan are inclined to estimate the 1961 Japanese pack of Reds at about 1,100,000 full cases, compared with about 830,000 full cases of Reds in 1960.

If Japan packed 1,100,000 cases of Reds in 1961, it established a new post-war record. Best previous pack is believed to have been that of 1957, which was one of the years they fished heavily above the Aleutians, and apparently on mature salmon bound for Bristol Bay.

rab Pioneer "Chirikof" Vorks With a New Mill

Harry Guffey's 70-ft. steel *Chirif*, which was perhaps the pioneer merican King crab packing vessel Alaska waters, with her first season e end-of-war year 1945, went north is season under the thrust of a new esel for a full schedule of salmon nd crab work.

Her heavy-duty, slow-speed engine as replaced with a 290-hp. turbo-harged Waukesha diesel turning 600 rpm., cut to 400 turns of her 4 by 42 Coolidge wheel by a 4:1 win-Disc reduction and reverse gear. here's a T-D power take-off on the ont end also, and Mathers clutch nd throttle controls.

"Like a Watch," Harold Johnson, left, tells Carl Harris, Waukesha salesman, about his new Waukesha-power Bumble Bee gillnetter on the CRPA cannery dock at South Naknek, Bristol Bay.

Equipped as she is for both sea water chilling and sharp freezing, *Chirikof* needs an auxiliary, and this is a 50-hp. Superior diesel.

She'll work for Pacific American Fisheries in the Port Moller and King Cove areas, and then after the salmon season will serve the company's King crab activities. Being in the King crab fishing business, she has a lot of use for sounders and carries two, a Raytheon Pathfinder Fathometer with 250 fathoms range, and a Ross Fisherman, sounding to 100 fathoms. Pilot is a Wood Freeman Metal Marine Pilot.

With her new power *Chirikof* averages 10.36 knots in a two-way run on the measured mile.

Dan Luketa, Seattle trawler, put a Waukesha identical to the *Chirikof's* in his drum trawlers and fish packer *Paul L.*

John Calise Heads Seine-Line Union

John Calise was re-installed last month as secretary-business agent of the Seine and Line Fishermen's Union, San Pedro, Calif.

Elected to serve two-year terms along with Mr. Calise were Nick Pecoraro, treasurer, and an executive board consisting of Ralph Averga, Pete DiMeglio, Manuel Granados, Frank Lesano, Mike Mattera, Steve Oliveri and Ralph Spinello. Bert Salvato was named chairman of the audit committee and Tom Monchetti chairman of the trial committee.

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NOTES ON NETS—
Japanese Swing to Monofilament for Salmo

● Monofilament salmon gillnets proved startlingly successful in the Japanese high seas salmon fishery of 1961, and the mothership-serving fleet can be expected to use them generally next year.

That is the belief widely expressed in Japan, where monofilament nets are called "transparent nets."

Reports in Japan say that the catch per unit of "transparent" gear used experimentally during the 1961 season were approximately twice those made by the multifilament nylon normally used; and that the cost of the "transparent" gear was only about 60% that of the conventional gillnets.

● Monofilament nets are believed to have been developed in Germany a few years ago. They have proven astonishingly effective on some kinds of fish.

Currently this gear is prohibited in United States salmon fisheries because of its presumed effectiveness and the fear that its use by an already powerful and effective fleet would force curtailment of fishing time in the interests of conservation to the point where fishing would be economically unprofitable.

● Canada joined in this prohibition of monofilament netting in salmon fishing, so far as 1962 is concerned at least, when late in July W. R. Hourston, Pacific area director for the Canadian Department of Fisheries, announced that use of this gear would not be permitted in British Columbia next year.

While some suppliers and fishermen protested the government's action at first, they accepted the ban with resignation when it was pointed out that the nets might seriously endanger escapement.

Mr. Hourston said it was known that a considerable volume of orders had been placed for delivery in 19 and that it was deemed only fair announce the prohibition of the n next season at least.

Tests of the mono nets in Riv Inlet and elsewhere showed they to significantly greater catches of Soc eye per unit than were secured w conventional nylon gear.

● United States experimental fishi carried out in the Skipjack fishery the Hawaiian Islands recently show that panels of monofilament nets to many times the number of tuna caug by conventional nylon web in adjo ing panels.

The Skipjack nets were fished combination with live bait chummi the gillnets being set in a circle arou a school of tuna raised to a feedi frenzy with live bait.

Out of a total of 326 Skipjack tak in the net, all but 5 were gilled in t monofilament panels.

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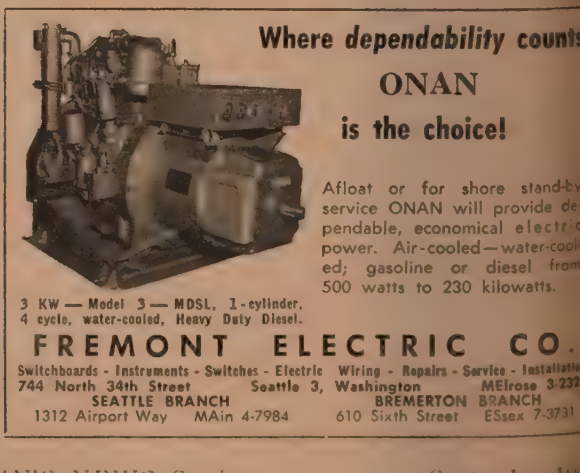
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fic American brass at the ADF&G Bristol Bay headquarters at King non, Alaska. From the left: Steig Osman, vice president, production; old Cameron, director; S. G. Tarrant, president.

o San Diego Boats nder At Sea

vo San Diego fishing vessels went n recently in heavy seas, *Daiho II* Cape San Lucas, tip of Lower Cali-a, and *Aloha* off Point Arguello, .

o one was lost. The nine men of *Daiho's* crew were picked up by ner San Diego fishing vessel, the *Val*, and taken to Magdalena Bay, Lower California. The *Aloha's* men were picked up by the Standard Oil tanker, *Chevron*. Although registered in Morro Bay, Calif., the *Aloha* had been fishing out of San Diego.

The *Daiho II* was owned by Daniel Orosco of Lemon Grove, Calif., who was aboard. The *Aloha's* owner was Howard Gilmore of Anaheim, Calif. Rescued along with Gilmore were Roger Clark of Half Moon Bay, Calif., James Casey, 76 years old, of Santa Barbara, Calif.

Besides Mr. Orosco on the *Daiho II* those saved were named as Daniel Orosco Jr., Juan Kennedy, Ray Rumph, Carmello Crisalli, Arthur Rodriguez, Oscar Berreyez, Randall Hill and Walter Wright.

Tacoma Boat Builds Largest Steel Seiner

Plans for the immediate construction of a 160' steel tuna seiner were announced in July by Arne K. Strom, veteran boatbuilder and president of the Tacoma Boatbuilding Co.

Mr. Strom said he hopes to lay the vessel's keel in September, with completion in the spring. It will be the largest tunaman ever built from the keel up as a tuna seiner.

Power for the big boat, which will have a frozen fish capacity of 600 to 700 tons, will be furnished by a 1,600-hp opposed piston Fairbanks-Morse diesel engine.

Tacoma Boat is already converting into a seiner the former *Washington Star*, operated by Al Davies of Birchfield Boiler, Inc., as a freezership in recent years.

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ishermen and other work boat operators like Hi-Tex best. They prefer it because it esists chipping, cracking, the bite of salt spray and all the other hardships of marine se. And . . . equally important . . . it stays brighter after two years than many enamels fter one! In white, or 20 brilliant colors, there's real economy in high quality Hi-Tex. sk for it at your dealers today.

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Japan's Skipjack Fishing is Heavy, With Albacore and Bluefin Better

● Tuna landings in Japan from the near-waters summer fishing were featured by a strong up-swing in Skipjack, with Albacore fishing improving with mid-summer after an erratic experience in spring months.

Notable also was the quantity of Australian Bluefin delivered from New Zealand waters. This seasonal fishery was expected to continue active until well into September.

The Australian Bluefin business was supplemented by an entirely satisfactory run of near-waters Bluefin, taken entirely by seiners, some of whom found the fishery extremely profitable this year.

The flush fishing for Skipjack was a dramatic reversal of the 1960 experience and the canners and katsuobushi producers were operating at capacity.

Now back to Albacore:

First two months of the season were rather dull, but an up-trend became established in June, with a slackening in the landed price. This induced buying for the U. S. export market, but the price there proved so unattractive that some of the fish was re-sold to the canners, normally the prime competitors of the Albacore exporters.

Albacore continued to come in fair volume to time of writing, but at relatively low prices, while interest of fishermen was diverted somewhat by the excellent fishing for Skipjack.

Bay Area Engine Sales

Joseph Alioto, trawler, owned operated by Tom Lazio Fish Co., reka and San Francisco, has been powered with a Model 21000 A Chalmers 250 cont. bhp. marine die engine fitted with a 4½-1 Capitol verse gear.

The engine was purchased fr Thomas A. Short Co., Oakland, installed by Lyman Repair Servi Eureka.

The Short firm also sold Carlsvik, Concord, Calif., for his troller *Wesley* a 6-cyl. Tasco F marine diesel engine, equipped w a 3-1 reduction gear, and Delco volt alternator and starter, and Mo controls.

21 Fishermen Can't Be Wrong

● One of the most interesting letters to appear in *Pacific Fisherman's* mail in a long time was signed by 21 fishermen.

They wanted something—and when 21 fishermen take the trouble to write this journal a letter they get what they want.

They were Columbia River g netters fishing the middle river, they want the full Bonneville salm escapement, by species, and *months*, published once more in *cific Fisherman Yearbook*. For past couple of issues the Bonnev data has been reported as an ann total.

These fellows want the details—a they'll get them.

Who are these earnest fishermen?

Charles Fleming, J. G. McGra Wiley Evans, Ivan D. Anunde, C. Harrison, D. E. Robinette, W. Evans, O. J. Gerrard, St. Helens, O

N. H. Forsberg, Claire Forsberg, W. Lentz, R. E. Tracey, Robert Fo berg, Ridgefield, Wash.

James D. Taylor, Deer Island, O Louis Rosini, Portland, Ore.; Da Sandstrom, Cathlamet, Wash.; W. Berry, Amboy, Wash.; C. R. Phill Sherwood, Ore.; H. L. Cunningha Forest Grove, Ore.; Carl Forsbe Longview, Wash. C. T. Schram, V couver, Wash.

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SANTA HELENA

Top Tunaboat of 1960

re is what Frank Gargas, skipper of the Santa Helena, says out Momoi tuna netting:

"I used a Momoi net on my former boat, and I know from experience that Momoi makes excellent quality synthetic webbing. With our Momoi net, we got all our netted fish into the boat. Also, I know other fishermen who use Momoi nets, and they have the same good luck I've had.
"On the Santa Helena I'm using 500 fathoms by 35 fathoms of Momoi high-tenacity Nylon N. 42 4¼-inch tuna webbing".

moi tuna net is made with Nylon filament produced by YO RAYON CO., Osaka, Japan.

MOMOI FISH NET MFG. CO.
Ako, Hyogo, Japan

MOMOI CO., INC.
1596 Judson St., Long Beach 13, California

Echo Sounders Serving Science As Well as Practical Fishermen

• Expanded scientific fisheries research activities ranging widely from Puget Sound to the lakes above Bristol Bay, and far out along the Aleutians this season saw the equipment of a number of vessels with Simrad white-line Skipper sounders whose characteristics make them specially applicable to the requirements of these scientific studies.

The installations were made by the Viking Equipment Co., Seattle, and are detailed by Ted Jules, its manager.

Included in this group of research vessels are those working under charter to the International Pacific Halibut Commission, including *Morning Star*, Capt. Lars Svege, *Arthur H.* and *St. Michael*.

Two University of Washington research craft are equipped with Simrad instruments of this type. They are: the College of Fisheries' vessel *Commando*, under charter to the U. S. Bureau of Commercial Fisheries for studies in cooperation with the Atomic Energy Commission; and the *Iliamna* of the Fisheries Research Institute, provided by Bristol Bay salmon packers to study fresh water phases of the Red salmon's life history.

Other vessels doing research work for the Bureau of Commercial Fisheries and using Simrad white-line sounders include the *Tordenskjold*, Capt. Carl Serwold, and the Bureau's own exploratory vessel *John N. Cobb*.

This latter vessel recently developed a new trawl spot for Pacific Ocean Perch off Heceta Bank, Oregon Coast, taking an estimated 40,000 lbs. in a 20-minute tow. So heavy was the catch that the trawl burst, making exact report on the size of the load impossible. Al Pruter, in charge of the exploratory cruise, said the tow was made with a standard type trawl in 700' of water.

The sensitive Simrad equipment helped in putting the net on safe bottom in the notoriously hard and rocky ground characteristic of the Heceta Bank's "rockpiles".

Norwegian Tuna Venture Off Africa Is Failure

Experimental longline fishing for tuna off Africa by a fleet of six Norwegian fishing vessels is reported to have been a failure. The fleet, which undertook the operation last fall der a guarantee from the Norweg government, is reported to have turned to Norway.

The fishing vessels were acco panied by the research vessel *Joh Hjort* and a transporter.

Shellfish Toxicity Forecas Target of Research

Dr. Albert K. Sparks, associate p fessor of fisheries at the University Washington, has been awarded a gr of approximately $50,000 from National Institutes of Health for t years' research on shellfish in Wa ington.

Under the grant, Dr. Sparks seek to learn how to predict co tions that cause toxicity to develop times in some shellfish. He will c duct research in four areas along Washington Coast, the Strait of Ju de Fuca, and Northern Puget Sou

The project will be conducted in operation with the Washington St Department of Health, which routi ly checks for toxic shellfish and c trols Washington shellfish areas wh unsafe for human consumption.

California Tunamen Mour Jose Medina, Pioneer

The U.S. tuna industry lost one its founders and most respected le ers last month when Jose Macha Medina, owner of the converted sei *Queen Mary*, died in a San Di hospital.

Medina was one of the abl spokesmen and champions of t vessel owners. Recently he took leading part in the negotiations w San Diego fishermen's unions. He an active member of the Americ Tunaboat Assn.

Born on the island of Pico in Azores, Mr. Medina came to the U as a boy. While still a young man, in depression times, he bought small clipper *Olympia* with financ help from his crewmen, who had fa enough in Medina's fishing ability back him with money as well as wo

Mr. Medina successively owned *Patria*, the *Cabrillo*, and finally *Queen Mary*, each bigger than last. He was navigator as well as m ter of his ships, and knew all the tails of every vessel, including the chanics of the engines and refrige tion systems. In 1949 he made one the longest exploration voyages e undertaken by a tuna clipper, sail to the Marquesas and the Galapa aboard the *Queen Mary*.

★ SELLING & BUYING ★

12¢ a word per time, $4.00 minimum. (For box numbers addressed to PFN, add $1.50.) Business card display—$29.00 per column in. per insertion, with lower rates on contract basis. Mail all copy to PACIFIC FISHERMAN'S NEWS, 500 Howard St., San Francisco 5, California.

60 KW Diesel Generator Set, 6-71 GMC Diesel Generator Set with 60 KW 450 V. AC Generator. This unit is skid mounted in like new condition, with radiator or marine cooling. WATERMAN SUPPLY COMPANY, INC., 2815 E. Anaheim Street, Wilmington, California, Hemlock 64288.

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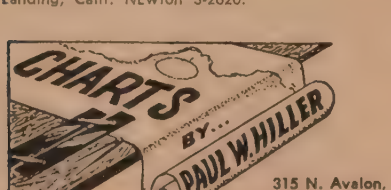

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New Combination Boats This Season

RED WING"—

Red Wing is a steel combination packer and Alaska-limit seiner, full of capability as she is of pment. She was at Kake this sum-, where Louie Frey of Seattle, her er and master, had a tender char-to Whiz Fish Products Co.

uilt in Seattle by Duwamish Weld-& Construction Co., she was pow- with a turbocharged Caterpillar el delivering 220-hp. at 1,225 rpm, 3.5:1 by a Caterpillar reverse and uction gear—all supplied by N C ine. Wheel is a 56 by 46" Olym- and the tail shaft is Monel, 3.5" 11'4".

or auxiliary she carries a 6-hp. le cylinder Lister diesel from Ma- Equipment Co.

ed Wing turned in a full 10 knots ner speed trials. She carries a lot uel, 5,200 gals., in six tanks: two ne engineroom, the double bottom er the fish hold, and three in the rette. Capacity is counted at 25,- Pinks.

n interesting gimmick aboard *Red g* is the use of the flattened steel topping her rail as a compressed receiver for the whistle.

er list of equipment is unusual-omplete for a 58-footer, includ- Marco hydraulic anchor and e winches; Ekolite depth sounder; rce-Simpson radiophone with rad antenna;

aud clutch control and Lear throt-nd power take-off controls; Wag-hydraulic steering; Jabsco pump. drich cutless rubber bearing.

apt. Frey had his boat well-pro-d: two coats of Galvicon, three ome places; Triple-A primer; and International "Interlux" on bot-,hull and interiors.

"NORTHERN DAWN"—

● Possibly the last vessel of its type to be built in British Columbia for some time owing to the rising cost of wood construction and the competition of steel and other materials, **Northern Dawn** was launched recently at the Matsumoto boatyard in Dollarton, B.C.

Northern Dawn, 76½' in length with 22' beam, is a combination craft that will be used for halibut, salmon and herring fishing by its owners, Tommy Pallent, John Johnson, George Olafson and Gordon Nicholls, all of whom have an equal interest. Johnson is skipper, Olafson engineer and Nicholls mate.

Capacity will be about 145 tons of herring. In accommodations, **Northern Dawn** is virtually identical to **Silver Bounty,** also built at the Matsumoto yard.

Main power unit consists of General Motors Series 71E marine diesel engines in tandem, developing 340 shaft h.p. at 1800 rpm. They are fitted wtih Falk 5:1 reduction gear with individual Allison hydraulic clutches. The engines turn a 60"x41"—45" tapered pitch Coolidge 4-bladed propeller at 360 rpm.

Electronic equipment includes two Ekolite sounders, an ER9-B recorder, two radiophones—a 75 watt Apelco and 40 watt Bendix, two APN Loran sets, a Decca 304 model radar, only one of its kind in a B.C. fishboat. There is also a Wood-Freeman automatic pilot.

The PAK-SHAPER

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Introduction of the PAK-SHAPER in 1949 developed in tuna canning a greater mechanization than had come about in 30 years of previous growth. Subsequent experience has proved its value to the industry. A large percentage of major tuna operators now employ the PAK-SHAPER.

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This MURPHY DIESEL has powered the NOYO STAR for 13 years

"Noyo Star has had the same crew and the same engine for 13 years of busy operation," says Manuel Figuerido, skipper-owner of the successful salmon fisher and drag boat out of Ft. Bragg, California, "and we wouldn't trade our Murphy Diesel for anything. It is economical, dependable, idles well or gives us 10 knots at 1200 rpm. We take care of this engine but we don't baby it. It gets about 300 hours per month of operation during the fishing season, giving us good fuel economy and a lot of confidence about getting back in." Bob Silvera and Jack Kostick, crew members for 13 years, are as enthusiastic about the Murphy Diesel as Figuerido. "We never have any worry about engine trouble," they say.

Before you power or repower your boat, ask Murphy owners in your waters about the advantages Murphy Diesel power can give you. Then ask your Murphy Diesel Dealer to explain the features that make Murphy Diesels top preference with so many successful fishermen.

Installed as original equipment in the Noyo Star 13 years ago, the Murphy Diesel develops 150 continuous hp at 1200 rpm, and uses 2:1 reduction and reverse gears.

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'OOD FISH
MARKETING
ction of PACIFIC FISHERMAN —

News and Views of National Trade in Fish and Shellfish

September 1961

Prices of Canned Salmon Take Time About Jelling

Canned salmon was still being ked in a number of major areas this issue went to press and the rket wasn't jelling. Major remain- uncertainty at that time was in supply of Pinks, and there was ndency to get the Pinks all counted ore going out generally with price erings.

New England Fish Co. declared it- as early as August 11, but to sstime other major packers had committed themselves broadly.

Nefco's market-opening price list its principal brands was: *Reds*, 5, $24 and $14.50 for talls, halves quarters, 48s, with 15¢ differen- for cases of 24s; *Cohoes*, $31, $19, s and halves; Pinks, $28 and $16; ums, $25 and $14.

Some factors quoted a week later, principal divergence being on ls, which for non-advertised brands e priced down to $35 for talls; .50 for halves and $13 for quar- .

With the Puget Sound Sockeye k not yet quite complete, and dis- ointingly small, the Fishermen's rking Corporation on Aug. 18 of- ed limited quantities at $25 per e of halves, machine filled; and for 48 quarters, hand filled; Co- s $19 and $12 for halves and quar- ; and Pinks at $15.50 for halves.

Alaska's Pink pack was right about illion cases at time of writing, and ld be expected to rise a little more. Puget Sound Pinks were just getting ted, and were an entirely uncertain element. The every-off-year pre-season jitters were affecting everyone in the industry, including the distributors. Domestic Pink supply was sure to be the best in several years, but just how much the best was still uncertain at presstime.

Canada, with an excellent pack of Pinks and Sockeyes both, was in fine shape in everything except Chums, which were worrisome.

California and Yukon Boost Mild Cure Pack

Flush production at the two extremities of the King salmon's range —California and the Yukon River— carried the Pacific mild cured salmon production to approximately 5,200 tierces by early August.

On comparable date in 1960 the pack was 2,749 tierces; and in 1959 it was figured at 7,375.

California again was back in the pack with a good figure—1,720 tierces (estimated). Alaska was pitiful except for the Yukon, whose estimated 500 tierces was a quarter of the state's total, figured at 2,057.

Puget Sound packing, with less than 1,100 tierces accounted for, was most discouraging.

British Columbia, with 331 tierces counted, again was playing-down the mild cure; although fish from Canada unquestionably supplied much of the raw material for Puget Sound splitting.

Pack of Fat Salmon Sold to Australia

In addition to the usual pack of "tidbits," the Japanese canned salmon pack of 1960 contained 22,000 full cases of pieces of the oily portions of the salmon (presumably the "tips," which are very fat, but contain considerable bone).

This pack was all put up by a packer specializing in the export trade. Offered to the market, the entire parcel was reported snapped up by a prominent Australian buyer. In view of the success of the product, an increased pack is anticipated this year.

Fish Divoteers' Fall Tourney September 15

Ken Williams, Marine Foods Packing Co., Seattle, president of The Fish Divoteers, has announced that the organization's 23rd annual fall golf tournament will be held Friday, September 15, at the Rainier Golf & Country Club in Seattle.

Reserved "tee-off" times will be available through the pro at Rainier beginning September 8.

"Talkeetna" Salmon Cargo Establishes New Record

Largest single cargo of canned salmon ever to come out of Alaska was brought down to Puget Sound terminal ports in August by the Alaska Steamship Co. steamer *Talkeetna*, which was featured on the cover of the July, 1961, issue of *Pacific Fisherman*.

She carried 323,728 full cases, valued at approximately $12,000,000.

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J. E. Bakkensen Joins Bumble Bee Sales Dept.

T. F. Sandoz, president of Bumble Bee Seafoods, Inc., Astoria, Ore., announces addition of Joseph E. Bakkensen to the company's sales department.

Mr. Bakkensen has several years' sales experience with the grocery trade of the Pacific Northwest. He also has a fine seafoods background, having worked for several summers in the Astoria and Alaska canneries of Bumble See Seafoods, Inc.

Initially Mr. Bakkensen will be assigned duties in the market centers of the Northwest states.

Howard Scott Passes

Howard L. Scott, for many years a leading figure in Pacific canned salmon selling, died at Bellingham in August.

Prior to his retirement in 1961, Mr. Scott was president of Deming & Gould Co., sales subsidiary of Pacific American Fisheries, Inc.; and also was vice president for sales of the present corporation.

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Edward Ericksen Chosen P.A.F. Controller

Edward Ericksen was elected vice president and controller of Pacific American Corporation at a recent meeting of the company's board of directors.

Mr. Ericksen, a certified public accountant, has been manager of the Portland, Ore., office of Touche, Ross, Bailey & Smart, international firm of public accountants. In taking over the newly-created officership with Pacific American, Mr. Ericksen brings with him an impressive background of accounting experience in food processing, covering both the fruits and vegetables and canned seafoods field.

Mr. Ericksen, 44, is a native of Astoria, Ore. He finished high school at Astoria and graduated from the University of Washington, in accounting.

After his Navy service Mr. Ericksen specialized in food processing accounting.

Pacific Fish Packers On NCA Officials Lists

National Canners Association 1961 directors among Pacific fish canners include: Milton E. Brooding, California Packing Corporation; Max J. Gorby, California Marine Curing & Packing Co.; John S. McGowan, Columbia River Packers Association; A. H. Mendonca, F. E. Booth Co., Inc.; S. G. Tarrant, Pacific American Fisheries.

Pacific members of the NCA Fishery Products Committee are: W. D. Moore Jr., Van Camp Sea Food Co.; Charles D. Alhadeff, Whiz Fish Products Co.; Aubin R. Barthold, Alaska Packers Association; Kenneth J. Berglund, American Tuna Canning Co.; Nick Bez, P. E. Harris Co.; Clifton D. Day, California Packing Corporation; Donald P. Loker, Star-Kist Foods, Inc.; T. F. Sandoz, Columbia River Packers Association.

Cordova Razor Clam Pack Short in 1961

With a pack of approximately 40,000 cases, the Alaska razor clam production of 1961 is normal or above; but this is due wholly to a sharp increase in the yield of the Kodiak Island area, which serves to offset a remarkable reduction in the pack of the Cordova and Copper River area.

Alaska state reports show thi
ter district, long the dominant
in razor clam production, yi
only 11,363 cases, against 28,31
the Kodiak district. The total o
676 cases is compared with 3
cases to approximately even da
1960.

Shimizu Canner Studies American Tuna Operat

Koichiro Mizushima, executi
rector of Shimizu Shokuhin K
Ltd., one of the leading tuna ca
companies in Japan, visited the U
States in the spring months, stu
operations in tuna canning, the
markets, and the market for c
mandarin oranges, in which his
pany also is a leading factor.

Shimizu is one of the three
tuna ports of Japan, and probab
leading point of landing and ca
for Albacore. Actually about 70
the Japanese pack of tuna is c
there, with equal percentages o
orange canning and green tea ha

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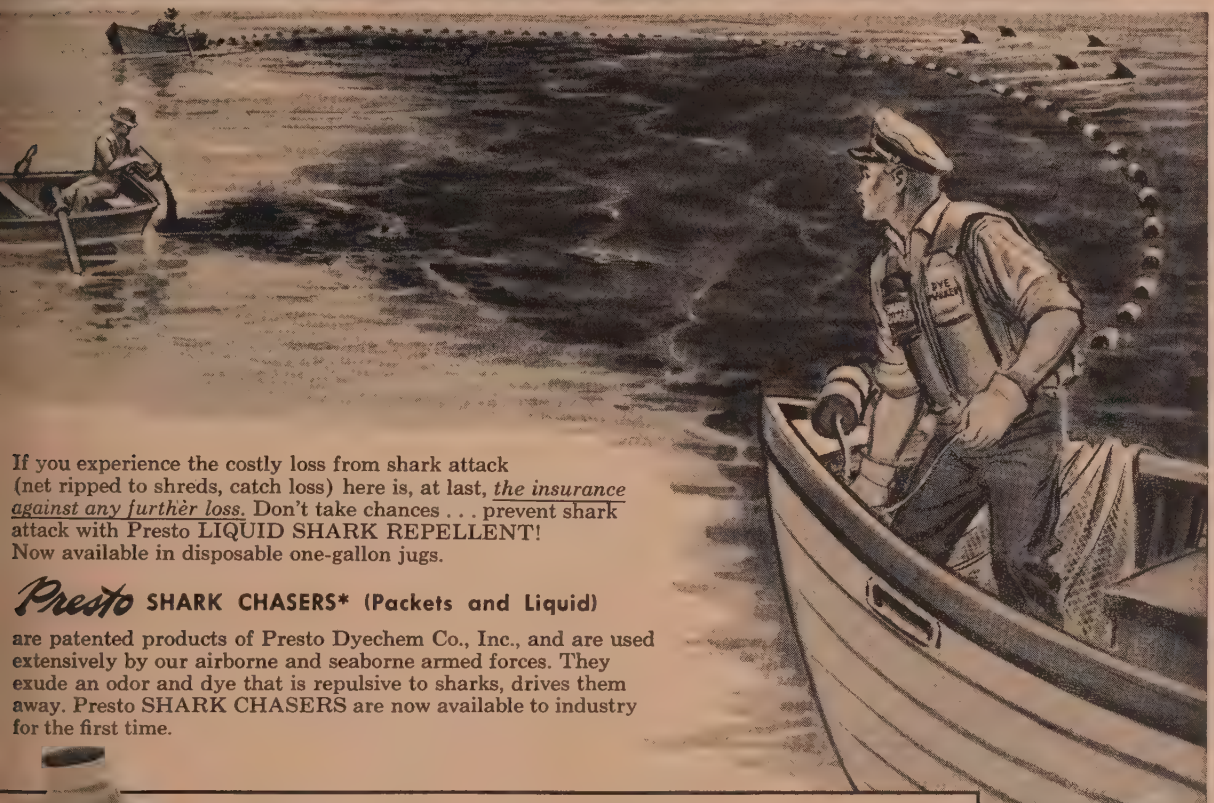

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Presto LIQUID SHARK REPELLENT

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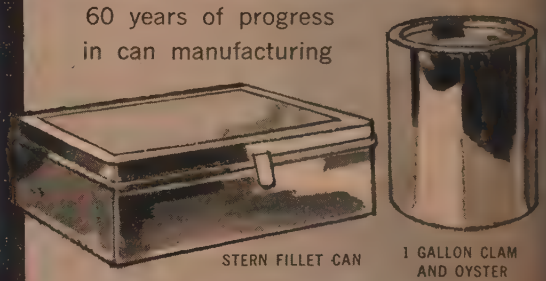

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. Salmon Sellers er Prosperous Britain

spect of the United Kingdom's g the European Common Mar- nd consequent loss of a tariff tage in British Columbia's most tant overseas market is being ted by Canadian fisheries oper- with resignation. Most of them e that while there may be tem- y disruptions and some losses ng-term benefits should be sub- al.

e Vancouver packer admitted while there was a good chance the 5% Commonwealth prefer- in the British market would be o the advantage of Russian, Jap- and U. S. competition in the d salmon field, membership in ECM was probably essential to mic survival for Britain.

'e would sooner take our chances g to a prosperous United King- than an impoverished one," he "We've traded too long with n to question her determination y from us regardless of trading and other complications."

v USBCF Lab nned at La Jolla

ns of the U. S. Bureau of Com- ial Fisheries to build a new 0,000 biological research labor- at La Jolla, Calif., are taking definite shape. Scripps Institu- of Oceanography at La Jolla has ed to provide the site at nominal It seems likely that the Uni- y of California regents will the remaining questions with Bureau at a meeting soon to be

ere is strong probability Congress rovide the amount budgeted.

e facility in view would be a -story building enclosing 50,000 ,000 sq. ft. and located on the ern part of the Scripps site at olla, about eight miles north of Diego. A staff of from 240 to researchers, who now occupy in scattered locations, would be ght together in the new facility. possible ground may be broken e the end of 1961.

non Brock Shifted Atlantic Research

rnon E. Brock, biologist, who devoted himself to the fisheries aquatic research in Hawaii since , in recent years as director of J. S. Bureau of Commercial Fish- eries' Hawaiian Area, was transferred in July to Washington, D. C., to become director of the USBCF Biological Laboratory.

In his new post Mr. Brock will be directing new programs of biological and oceanographic research in the tropical Atlantic Ocean, where the tuna fisheries are developing rapidly and becoming of increasing importance to the American tuna industry. He will also be concerned with the expanding oceanographic research programs of the Bureau of Commercial Fisheries and the coordination of those programs with ocean research by other agencies.

E. L. Harrison Shifts From Fish to Forests

Edward L. (Bill) Harrison, for several years vice president, industrial relations, British Columbia Packers, Ltd., has resigned his office to become executive assistant to J. V. Clyne, chairman of the board, MacMillan, Bloedel & Powell River, Ltd. Both companies were for many years directed by H. R. MacMillan, who is still an influential figure in their operations. Mr. Harrison retains membership in B. C. Packers board of directors. He is currently president of the Vancouver Board of Trade.

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There's plenty of common sense in a line that's tough enough to stand the daily gaff in the crab and salmon fishing industries. And there's plenty of not so common cents in a line that will work harder and last longer under such rugged conditions of use. That's where there's both sense and cents in synthetics. Tubbs Nylon and Polypropylene pot warp and fishing ropes provide high strength, and maximum resistance to abrasion, deterioration, moisture, and marine organisms. They are lightweight, easy to handle, have good working elasticity, and are economical, too. They'll last longer, and provide maximum return on your rope investment. For information about sense and cents in synthetics, call or write for your copy of Tubbs' 24 page Technical Reference Manual.
* dollars and cents, that is

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Admiral Gehres Heads National Marine Terminal

Rear Admiral Leslie E. Gehres, retired, last month was appointed general manager of National Marine Terminal of San Diego, Calif.

National Marine Terminal is the operating company for the Westgate fleet of tunaboats, which supply the Breast-O'-Chicken tuna. The two firms are associated and are also affiliated with the United States National Bank of San Diego.

Admiral Gehres comes to NMT from Ryan Aeronautical Co., where for seven years he was personnel and security relations director and for six months director of security and civic affairs. While in active Navy service, Admiral Gehres commanded vessels ranging from a sub-chaser to an aircraft carrier. He was also Commandant of North Island (San Diego) Naval Air Station.

B.C. Salmon Operators Win Safety Awards

The Fisheries Association of British Columbia, representing the major fish packing companies of the province, has received the National Safety Council's 1961 association safety award.

Other awards recognizing effective safety programs have been won by the Glenrose cannery of Johnston Fishing & Packing Co., J. H. Todd & Sons, shore operations, and A. B. C. Packing Co.'s North Pacific cannery.

Henry Doyle, Salmon Historian, Passes

Henry Doyle, prominent in North Pacific fishing and canning operations for many years, and one of the organizers of the B. C. Packers Association in 1902, died recently at his home in Sherman Oaks, Calif., aged 87.

His father operated a fishing supply house in San Francisco and other coast cities at the turn of the century and young Henry, then 16, was sent to B. C. as his representative. A few years later he joined with the late Aemilius Jarvis of Toronto to form the association representing various coast canneries in B. C., becoming general manager and managing director.

Mr. Doyle was also prominent in canning operations in northern B. C., at such places as Namu and Kincolith. He retired in 1919 and wrote a history of the coast salmon industry. In 1947, after more than half a century's residence in B. C., he mo to California.

The B. C. Packers Association, a various reorganizations, gave birth B. C. Packers, Ltd., one of the wo great fishing and packing organ tions, based in Vancouver, B. C.

King Crab Abundance Puts Boats on Limits

King crab fishing out of Ali Kodiak Island, was good in Au and the plants there were going str

Mercator of Pan-Alaska Fishe now freezing all her catch and longer operating as a cannery, on station and busy.

Abundance of crabs was such the limit flag flew over Alitak op tions on occasion.

Don Saxby Elected Canners League Preside

Donald T. Saxby of the Califo Packing Corporation's administra staff, long in charge of its fish ning activities in California, an director of the Alaska Packers A ciation, this spring was elected p dent of the Canners League of fornia.

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for smooth dependable performance, and unmatched maneuverability.

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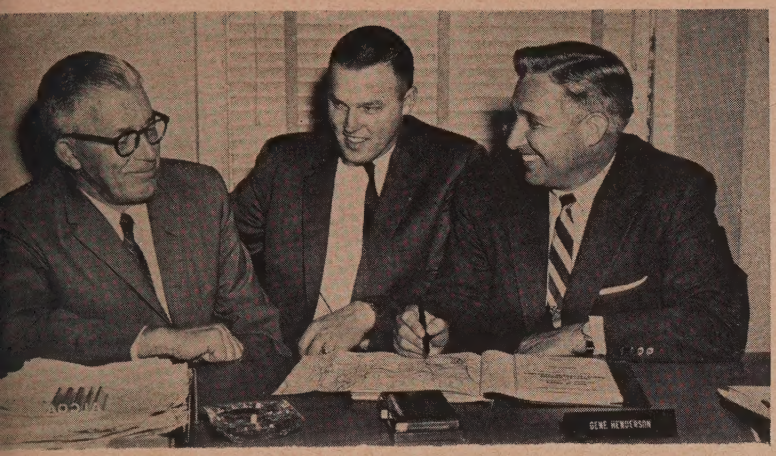


Telephone Service of Pacific Telephone & Telegraph Co. becomes the ial responsibility of H. H. (Buzz) Honsaker, center, as result of the nt transfer of C. E. (Pat) Towle, left, to Sacramento. In the picture, . (Gene) Henderson, district sales manager, briefs them in their new gnments. So it will be Buzz Honsaker on whom Pacific fishermen will end hereafter to continue the remarkable ship-to-land line by which talk to their homes and hail their catches to the fish exchanges.

pan O. K.'s 10 New Type Tuna Ships

new-type tuna operation is pro- d for in Japan Fishery Agency nses granted this summer for 10 rtable fishing vessel type tuna herships."

lthough they are officially called otherships," the vessels are under- d to be fishing craft which will served by one of two "portable" ing vessels, apparently without age capacity, which will deliver he larger craft.

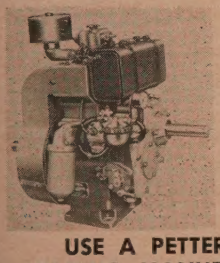
he 10 craft are licensed to eight panies, at least two of which ap- r to be new to the prosecution of high seas tuna fishery.

icenses for two of the new-type sels were granted to Nichiro Gyo- gyo K.K., and Seinju Gyogyo K.K. One vessel is licensed to each of these firms: Hoko Suisan K.K., Kyokuyo Hogei K.K., Showa Gyogyo K.K, Taiyo Gyogyo K.K., Osaka Uo-ichiba K.K., and Daito Gyorui K.K.

These latter two are large fish wholesale companies, Uo-ichiba (which means "fish market") with headquarters in Tokyo; and Daito Gyorui in Tokyo.

Daito is headed by Seiji Hayashi, a leading figure in the Tokyo Central Fish Market, who visited Seattle, Puget Sound and British Columbia about a year ago in the course of a world tour of fisheries centers.

PETTER DIESEL ENGINES AND GENERATING SETS



Drive your auxiliary equipment with a small diesel—Ideal power for generators, winches, compressors, pumps.

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1½ to 104 H.P.

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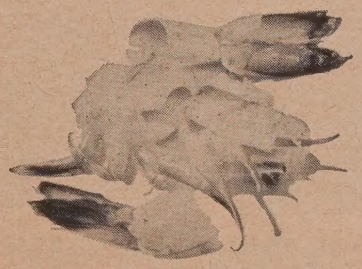
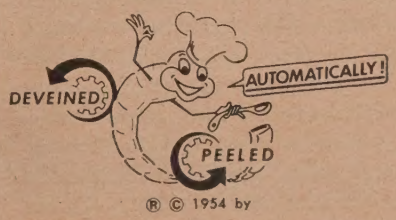
Isn't there more profit in selling shrimp...

than there is in selling shells?



The Peelers Co. specializes in automatic shrimp peelers, deveiners and graders.



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Write, wire or phone

Rigid collars keep this float's throat from being slit

New gillnet float by B.F.Goodrich reinforced with tough grommets

If you've ever had your floats ripped apart by the weight of gillnets—here's news. This new surface float, developed by B.F.Goodrich, is reinforced at both ends with rigid plastic collars—called "grommets"—which take the wear, the weight, the rub. This tear-resistant reinforcement makes the float virtually indestructible.

The float itself is made of extra-tough unicellular plastic, is lustrous white for maximum visibility, and has all the other advantages of the famous BFG "Spongex" seine float. It's light, permanently buoyant, dries quickly, won't break or crumble. It will not absorb water, oil or gasoline, never gets waterlogged.

These new floats have a 16-ounce buoyancy — are 5⅛"-5⅝" long, 3⅛"-3½" in diameter, and have a 9/16"-11/16" inside grommet diameter.

Reduce your costs by asking for long-lasting B.F.Goodrich gillnet and seine floats. If your supplier doesn't have them in stock, ask him to write *The B.F.Goodrich Company, 145 Derby Place, Shelton, Connecticut.*

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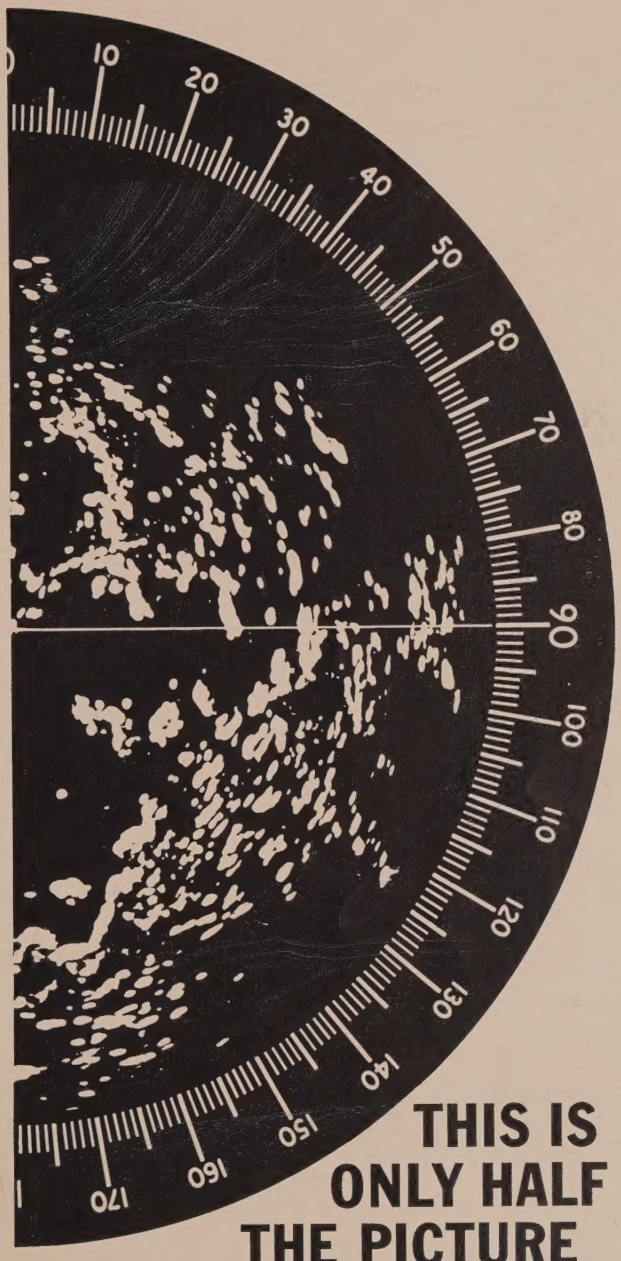

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RAYTHEON Radar's smooth, accurate performance. The hidden half is just as good. The years of research and "torture" testing by the world's largest producer of marine radar. The integrity that won't release a model until it's as bug-proof as man can make it. Result: radar with real guts. You get far more, go far more miles between maintenance. And you get better service when you need it. Raytheon has the world's largest service organization of its kind: gives you factory trained specialists in all major fishing ports.

Ideal for fishing craft, workboats, tugs, party boats and harbor craft, is Raytheon's Model 1700. Installs easily, with only two units: Indicator, with large 7-inch screen and ½-, 2-, 6- and 12-mile ranges — and antenna, housed in rugged, water-proof fiberglas. At $2450, ($2487 West Coast) the Model 1700 is the lowest cost proven radar.

Contact your nearest Raytheon sales office, or write Raytheon Company, Dept. P, South San Francisco, Calif. for further information.

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MARINE PRODUCTS OPERATION
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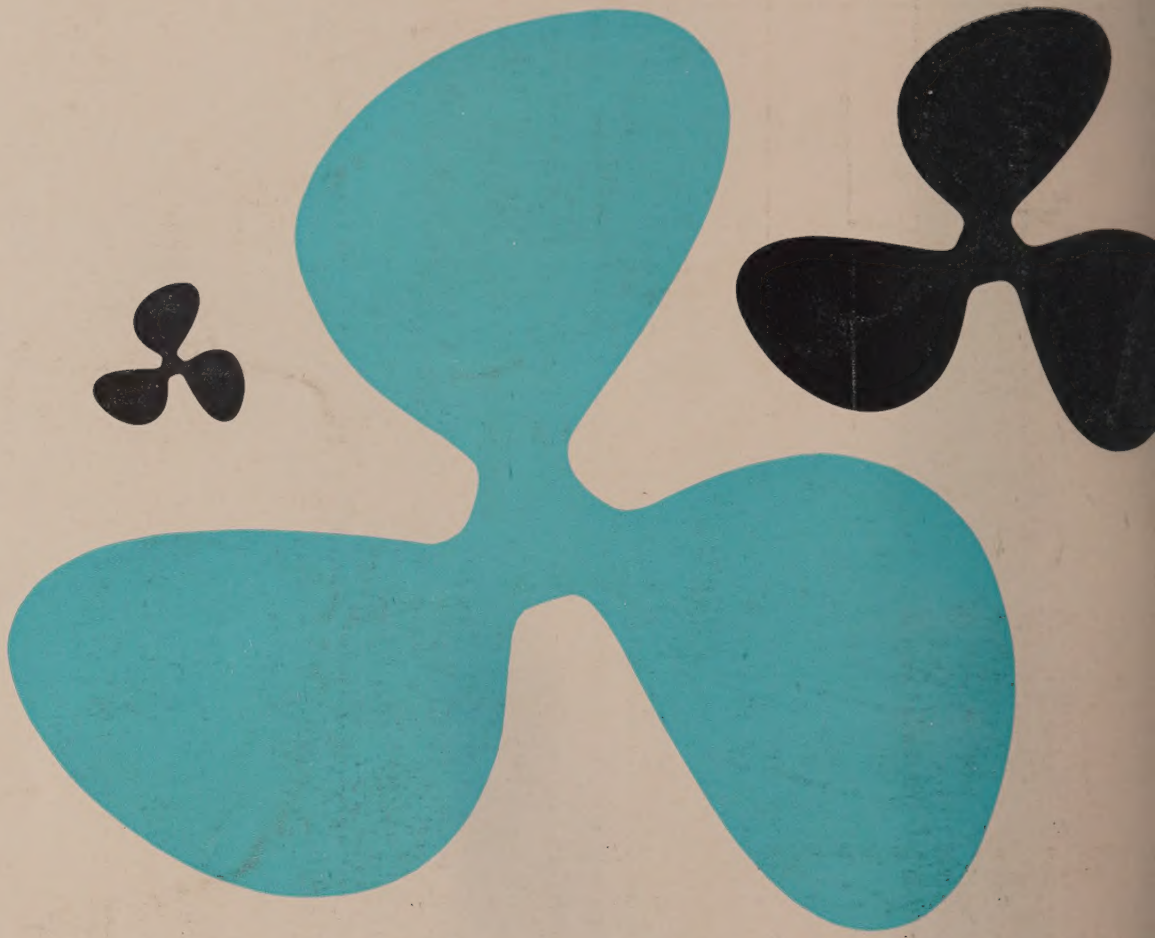

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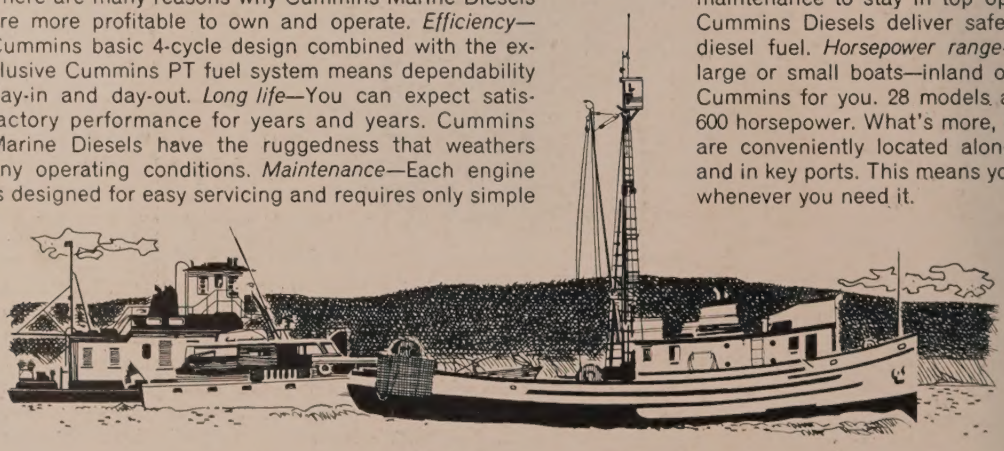

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